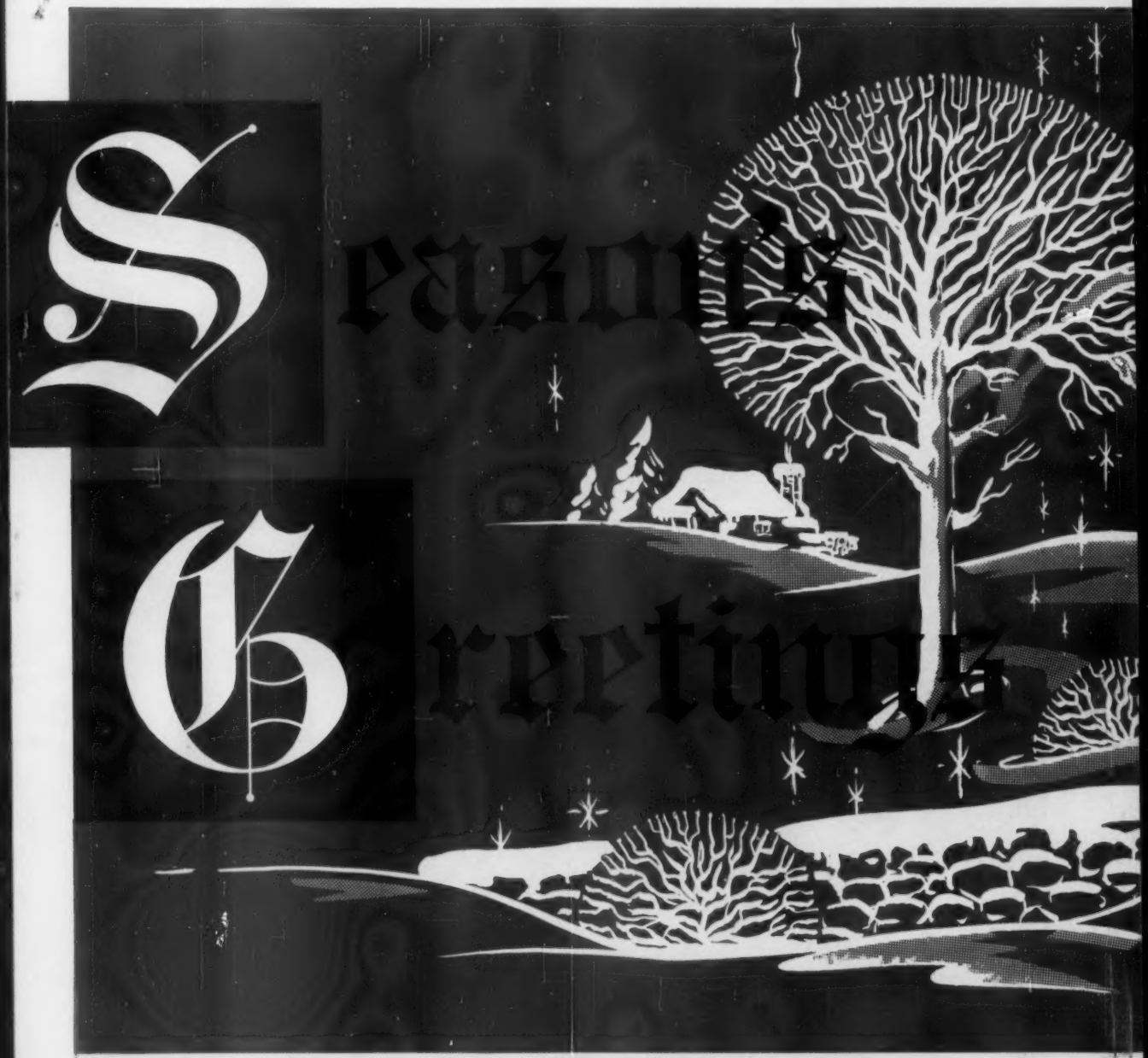
DECEMBER
1959

PRICE 75 CENTS

ELECTRICAL CONSTRUCTION AND MAINTENANCE

WITH ELECTRICAL CONTRACTING



A McGRAW-HILL PUBLICATION | 59TH YEAR

A NEW $100,000 LIGHTING TOOL FROM GUTH

NON-COMBUSTIBLE* GRATELITE

LOUVER DIFFUSER†

FOR LUMINOUS CEILINGS

Five years of time and over $100,000 in research and engineering . . . that's what it took to create this even greater GrateLite in new 2′ x 2′ module units.

It's molded of non-combustible plastic . . . listed by Underwriters' Laboratories, Inc., as NON-COMBUSTIBLE with a low 25 rating.

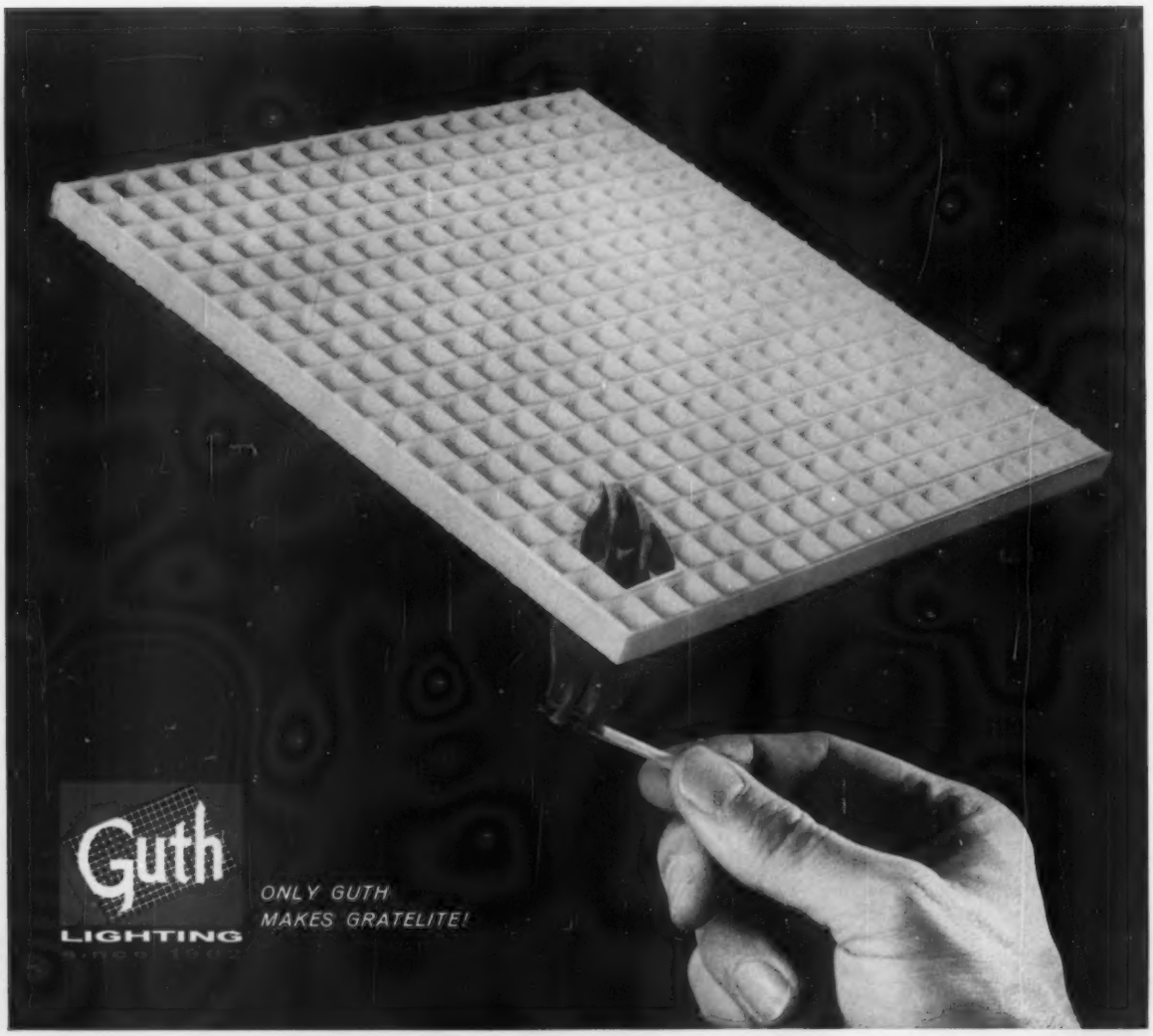
Supported by Guth Una-Tee system, N. C. GrateLites can't fall out and cause panic.

And—GrateLite (with exclusive 3/8″ cubicles) offers all the beauty and lighting advantages of the original GrateLite. Plus—it's non-electrostatic . . . repels dust and dirt for easiest maintenance.

WRITE FOR N. C. GRATELITE BROCHURE NOW

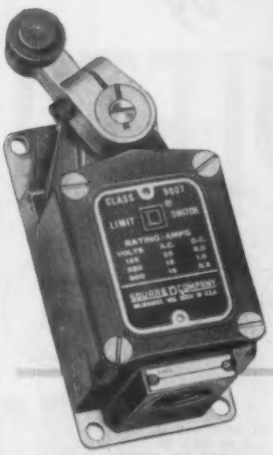
THE EDWIN F. GUTH CO.
ST. LOUIS 3, MO.

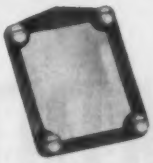
*Listed by Underwriters' Laboratories, Inc.
†® U. S. Pat. No. 2,745,001 Can. Pat. 1957, No. 538,245



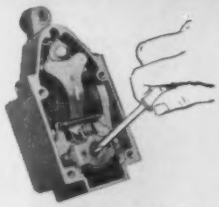
SQUARE D LIMIT SWITCHES

DESIGNED TO DO HUNDREDS OF JOBS... Better!





Instant visual inspection of mechanism through transparent plastic cover (optional). A tremendous time saver in multiple switch installations.



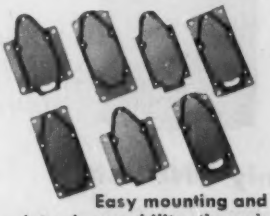
Eleven contact arrangements in one switch...and all you need to make the changes is a screwdriver!

Simplified stocking because basic switches and a wide variety of lever arms are packaged separately. Moderate stock handles a multitude of combinations.

HEAVY DUTY

OIL-TIGHT • Class 9007, Type T

Continuously adjustable operating lever arms permit an infinite number of adjustments. Up to 80° overtravel reduces arm breakage.

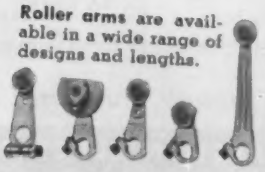


Easy mounting and interchangeability through wide variety of base plates and side mounting holes.

SMALL
OIL-TIGHT
Class 9007, Type A

Small precision limit switch available in three forms—basic contact mechanism, flush or surface mounting. Both flush and surface mounting switches are available with varying lengths of roller arms and with rollers of different types and sizes. Also push rod operated (*shown above*) and in single unit or duplex construction.

Roller arms are available in a wide range of designs and lengths.



Write **for Bulletin 9007** *which gives the complete details of Square D's complete line of oil-tight limit switches*

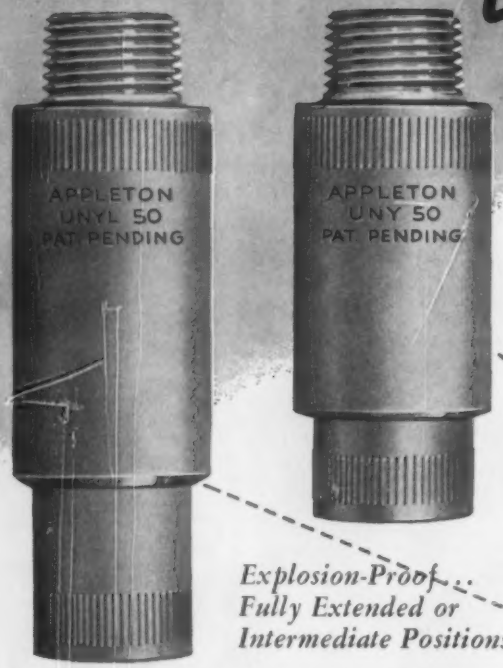
Address Square D Company, 4041 North Richards Street, Milwaukee 12, Wisconsin

EC&M HEAVY INDUSTRY ELECTRICAL EQUIPMENT...NOW A PART OF THE SQUARE D LINE

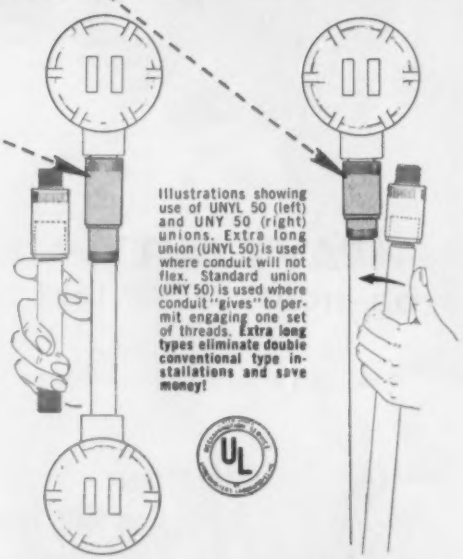
SQUARE D COMPANY

Self-Adjusting! Explosion-Proof!

EXPANSION UNIONS by APPLETON



Explosion-Proof... Fully Extended or Intermediate Positions



Illustrations showing use of UNYL 50 (left) and UNY 50 (right) unions. Extra long union (UNYL 50) is used where conduit will not flex. Standard union (UNY 50) is used where conduit "gives" to permit engaging one set of threads. **Extra long types eliminate double conventional type installations and save money!**

EXTRA LONG
UNYL Union showing up to 1-11/32" expansion . . . serves the purpose of two conventional type unions!

STANDARD
UNY Union showing up to 21/32" expansion . . . for installation wherever conventional types were previously used!

Only ONE Unit . . . Two Moving Parts

APPLETON Explosion-Proof Expansion Unions are completely different... afford an ease and simplicity of installation never before known with this type of explosion-proof equipment!

Expansion adjustment is built-in! The *two* moving parts telescope or expand to accommodate usual thread lengths. Only *two* tightening operations . . . each made separately! Smaller external diameters for convenient use in restricted quarters! Precision construction for absolute explosion-proof protection . . . no need to worry about failure to draw surfaces together . . . the union remains completely explosion-proof at all times, regardless of its retracted or extended position! Special design guarantees positive ground at all times!

Get acquainted with the *extra* quality and utility built into APPLETON Explosion-Proof Expansion Unions. Write for complete details.

Sold Through Franchised Distributors Only

APPLETON ELECTRIC COMPANY
1723 Wellington Avenue • Chicago 13, Illinois

Also Manufacturers of:

Rely on **APPLETON** *... The Standard for Better Wiring*

ELECTRICAL CONSTRUCTION AND MAINTENANCE

with which is consolidated Electrical Contracting, The Electrogist and Electrical Record — Established 1901

Published for electrical contractors, electrical departments in industry, engineers, consultants, inspectors and motor shops. Covering engineering, installation, repair, maintenance and management in the field of electrical construction and maintenance.

59TH YEAR • DECEMBER 1959

MORE

"Home buyers will go for an improvement like that. Thanks for suggesting it!"

This is a typical comment after the Graybar man spells out a new item to help an electrical contractor.

And many are the practical suggestions the Graybar man makes in the course of his calls. For he knows "what's cooking." He's wide awake to the new developments in home lighting, for example. He's a bug on high efficiency, time-saving tools and equipment. But whether he talks entrance panels, wiring devices, tools, fixtures or other, he makes it *his* business to improve *your* business.

Moreover, the Graybar Field Salesman is just one of four experts who make up the Graybar contractor service team. The others: Inside Salesman, Counterman, Specialist. And somewhere along the line all four can be of substantial help to you . . . *can help you improve your business . . . reduce your costs . . . speed your work.*

It will pay you to know Graybar better. Call us. 915

Graybar Service includes: Objective recommendations • On-the-job technical help • Most complete lines • Planned stocks to meet your needs • Expert counter service • Speedy handling of will-calls.

GraybaR

ELECTRIC COMPANY, INC.

Everything Electrical — GraybaR Electric Company

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ELECTRICAL CONSTRUCTION AND MAINTENANCE

DECEMBER • 1959 continued

Vol. 58, No. 12 ELECTRICAL CONSTRUCTION and MAINTENANCE DECEMBER 1959

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Sidelights

NECA Convention

A new attendance record was set at the Miami Beach convention of the National Electrical Contractors Association. Official registration exceeded 3,000 for the convention and trade show held November 9 to 12. *Electrical Construction and Maintenance* editors covering the activities found a high level of confidence in the future outlook for new business and continued industry growth. The business programs explored a wide area of current problems and industry developments while the trade show displayed the latest in materials, equipment and tools. A camera round-up on personalities at the convention opens on page 76. The report of the business sessions begins on page 155.

Office Building Modernization

The 13-floor KLM building in New York was rebuilt from a stripped-down shell involving many special design and installation problems in the modern new electrical system. Ebner Associates were the consulting engineers and Davidson Electric Company, Inc., the electrical contractors on the project. Associate Editor J. F. McPartland gives an on-the-job report of many useful design and construction details in "Details in Commercial Rewiring" beginning on page 72.

Modular Distribution

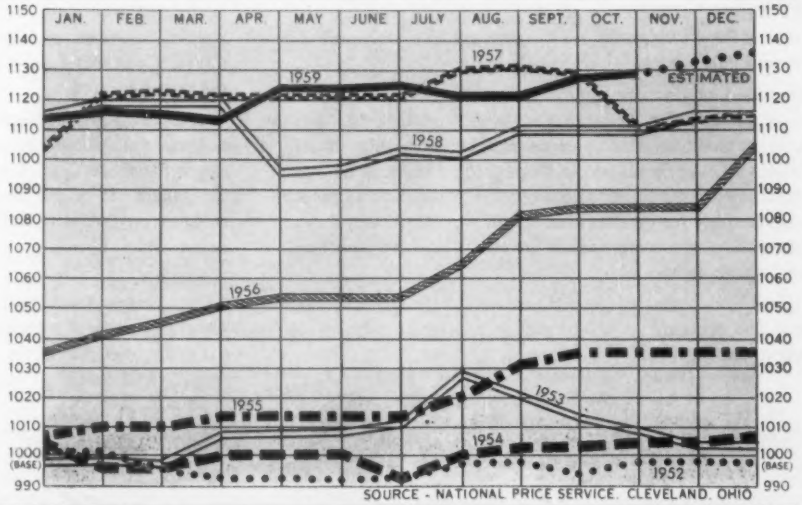
Plans for the new headquarters building of the Maytag Co. in Newton, Iowa, were drawn to provide the maximum of layout flexibility and, consequently, a fully accessible underfloor duct system was included. With a modular placement of lighting and air conditioning, the electrical system provides for quick change at minimum cost. Associate Editor August Eckel describes the features of the electrical system in "Modular Electrical Distribution" beginning on page 63.

New Power Sources

Two new primary sources of electric power are opening up new horizons for the electrical industry. A "fuel cell" in which the chemical energy of propane gas was converted directly into electric energy, recently powered the electric motor drive of a full sized farm tractor. Fuel cells can achieve very high efficiencies and may provide the future energy source for silent, fume-free, electrically driven vehicles. Another radically new source, also providing a large gain in efficiency, involves the application of magnetohydrodynamics (MHD). A high-temperature, ionized gas is pumped through a magnetic field. Current is drawn directly from electrodes on opposite sides of the gas chamber at right angles to the field. The ionized gas can be produced in a chemical furnace or a nuclear reactor and re-cycled in a closed system. The fuel cell was demonstrated by Allis-Chalmers. General Electric and Avco Corp. have reported development work on MHD.

ELECTRICAL MATERIALS COST INDEX

BASE LINE IS 1000 AND REPRESENTS COSTS OF A TYPICAL ASSORTMENT OF MATERIALS FOR A SELECTED JOB AS OF NOVEMBER 1, 1951. THE INDEX POINTS REPRESENT THE VARIATION OF THESE SAME MATERIAL COSTS AS OF THE FIRST OF EACH MONTH.



SOURCE - NATIONAL PRICE SERVICE, CLEVELAND, OHIO

New switch for matchless safety

Now, for the first time, the new American Electric Type "ND" Safety Switch offers *all* of the features "most wanted" in *one* safety switch by people who work with and use electrical equipment.

Included among the many "extras" to be found in this newest of safety switches are: visible double blade construction; positive, snap-action make and break; double insulation between blades and operating mechanism; optimum-size enclosures for maximum heat dissipation; plenty of wiring space for easier, faster installation; and an exclusive safety-yellow operating handle for quick, positive "spotting" even in poor light.

These and countless other field-tested design standouts assure the ultimate in safety switch protection with maximum operating life.

This new American Electric Normal Duty Safety Switch is, in fact, the result of the same kind of thorough engineering research and workmanship which has long made Clark Controller *"the standard of quality"* for industrial electrical control.

It meets NEMA standards for normal duty industrial and commercial use and is approved by Underwriters' Laboratories for these applications as well as for service entrance equipment. It is currently available in 30-ampere and 60-ampere, 250-volt and 600-volt ratings, both fusible and non-fusible.

Bulletin 250-ND fully describes every detail of this new switch designed for "matchless safety". For your free copy see your nearest American Electric Switch—Clark Controller Company distributor. Or, write direct. 9851

American
ELECTRIC SWITCH DIVISION

The **CLARK CONTROLLER** *Company*

Everything Under Control • 1146 East 152nd Street • Cleveland 10, Ohio

Washington Report

DECEMBER • 1959

Steel mills returned to close-to-capacity operations rapidly following the 116-day strike shutdown. But the business outlook for 1960 remains confused and complicated, pending final outcome of the steel industry—United Mine Workers' settlement, either before the 80-day Taft-Hartley injunction period ends, or afterwards.

Impact of the strike on the economy has been far less than was expected, but was two-fold: 1) lost output of steel itself as a portion of production; and 2) spreading disruptions in autos and other consumers' durable goods. The FRB Index of production in October was 148, only 7 points from its June high of 155. And the gross national product for the third quarter dropped to $478.6 billion from the second quarter record of $484.5 billion, Dept. of Commerce estimated.

National economy strength is reflected by some of the current economic statistics:

- Personal income in October rose to a $382 billion seasonally-adjusted annual rate. The pre-strike high was a $383.3 billion annual rate, reached in June.
- Some Government economists expect a fourth-quarter improvement in gross national product that will place GNP for 1959 at about $480 billion. This would compare with 1958's annual figure of $441.7 billion.
- Retail sales for 1959 are expected to exceed $200 billion, a record. Christmas business is also expected to hit a new high. Dept. of Commerce estimated October retail trade at over $19 billion, or 9% ahead of October 1958.
- Cost-of-living index for October hit a new high of 125.5% of the 1947-49 average.
- Employment in October reached a record 66,831,000 up 484,000 from September, while unemployment also rose 42,000 to 3,272,000.

Federal spending for fiscal 1961 will total $81 to $82 billion, according to preliminary budget estimates. This reportedly will be about equally divided between defense and civilian spending. Federal spending in fiscal 1960 is expected to total about $78.9 billion, with odds against a balanced budget due to the reduction in income as a result of the steel strike.

October construction totaled $4.8 billion, according to Census Bureau, down 7% from September. This was still 1% above the October 1958 total, while the $45.7 billion total for the first ten months of 1959 was 13% greater than the similar 1958 period. The October decline was attributed to the steel strike.

Private housing starts in October dropped 13% from September, to 102,000, while publicly-financed housing unit starts totaled 3,000. The seasonally-adjusted annual rate of private housing starts for the first ten months of 1959 averaged 1,356,000, compared with 1,089,000 for the same period in 1958. Starts on publicly-financed housing units over the ten-month period this year totaled 32,900, far below the 63,800 total for the similar 1958 period.

Electricity production continues to outpace year-ago weekly totals by about 5%, with weekly output now averaging close to 13 billion kwhr. Gains are showing up in all geographic areas across the country, with the South Central and Pacific Southwest showing greatest percentages.

WAGNER Dry-Type *General Purpose* Transformers

...WHISPER WHILE THEY WORK

New... from Wagner... totally enclosed dry-type transformers *filled with epoxy compound*. Their designation: Type AE Single Phase, 1 to 10 Kva.

Use these transformers for all general purpose applications, including those where noise must be minimized. They have a low sound level... the result of encasing smaller Form W core and coils in solid epoxy compound. The compound insulates, reduces sound-producing vibration caused by core excitation ... and provides enough support and mechanical strength to eliminate the need for metal framework and other sub-assemblies that are subject to vibration. *The result:* a whisper-quiet transformer that can be used anywhere, even in quiet areas of offices and hospitals.

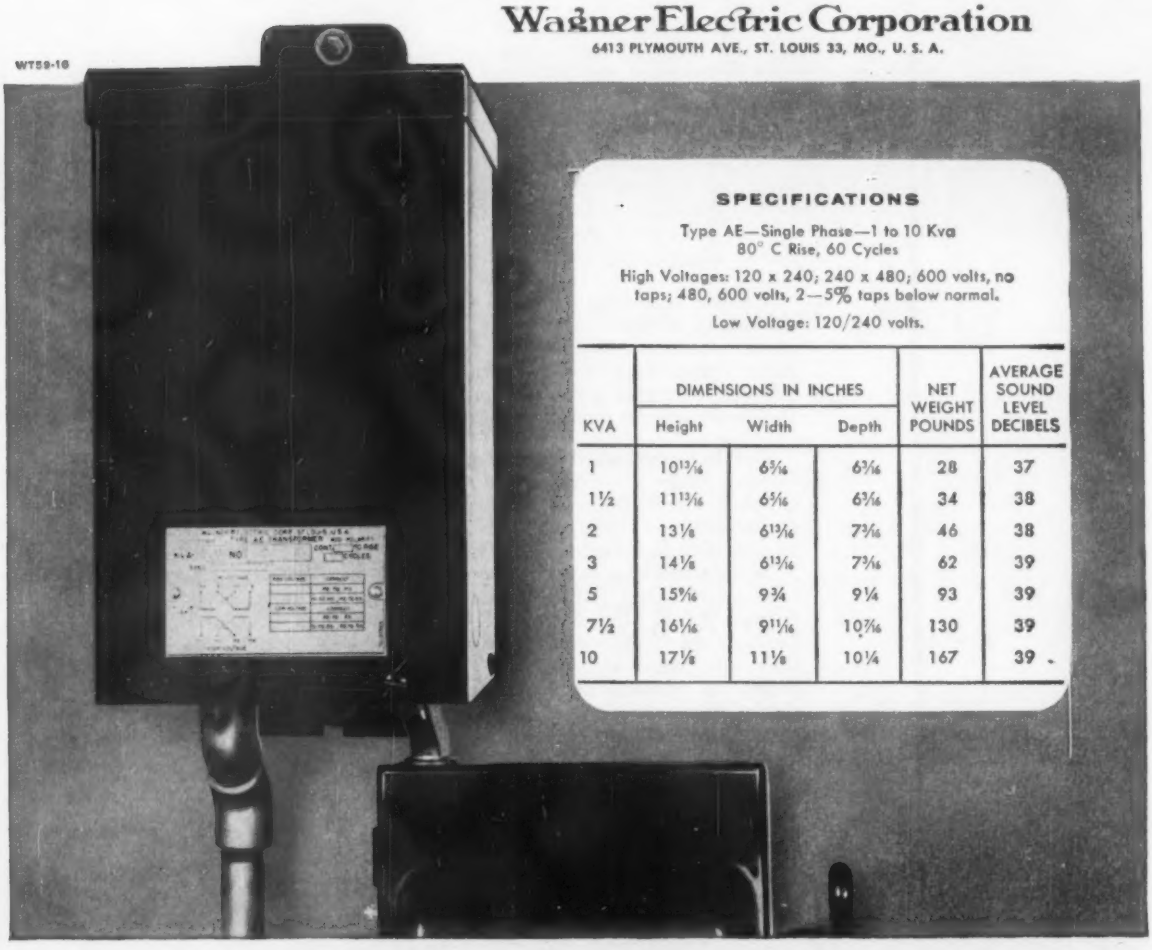
Wagner Type AE transformers do more than silence sound, of course. They improve voltage regulation, and have better insulation protection (suitable for continuous operation at 80°C in a 40°C ambient). All parts are sealed from dust, moisture and corrosion by the epoxy compound. Naturally, every unit is built to conform to all applicable standards of ASA and NEMA.

Wagner Type AE transformers can be installed indoors or out... in any location where they will not be submerged or exposed to injurious fumes in concentration. They are compact and lightweight and can be mounted in any position, at any angle... on walls, floors, or ceilings.

Like to know more? Wagner branches and distributors have all the details. There's one near you. Call or write now.

Wagner Electric Corporation
6413 PLYMOUTH AVE., ST. LOUIS 33, MO., U. S. A.

WTES-10



SPECIFICATIONS

Type AE—Single Phase—1 to 10 Kva
80° C Rise, 60 Cycles

High Voltages: 120 x 240; 240 x 480; 600 volts, no taps; 480, 600 volts, 2—5% taps below normal.

Low Voltage: 120/240 volts.

KVA	DIMENSIONS IN INCHES			NET WEIGHT POUNDS	AVERAGE SOUND LEVEL DECIBELS
	Height	Width	Depth		
1	10 13/16	6 5/16	6 5/16	28	37
1½	11 13/16	6 5/16	6 5/16	34	38
2	13 1/8	6 13/16	7 5/16	46	38
3	14 1/8	6 13/16	7 5/16	62	39
5	15 5/16	9 3/4	9 1/4	93	39
7½	16 1/16	9 11/16	10 7/16	130	39
10	17 1/8	11 1/8	10 1/4	167	39

KAISER ALUMINUM

KAISER ALUMINUM RIGID CONDUIT

IS A SURE BET TO LOWER COSTS

BECAUSE...

IT COSTS NO MORE TO BUY

And IT OFFERS COMPLETE ASSURANCE

Contractors everywhere are finding that the old ways aren't necessarily the best ways when it comes to buying and installing rigid conduit. The big money-saver is aluminum . . . for good reasons.

1 *Low initial cost.*

Today, aluminum conduit costs no more than steel . . . an important factor to consider when figuring your bid.

2 *Lower installed cost.*

Aluminum conduit weighs only *one-third as much* as the same size steel conduit. Result: easier handling . . . less worker fatigue . . . easier cutting, threading, bending . . . faster, more economical installation.

3 *Lower maintenance costs.*

Because aluminum conduit can't rust and is highly resistant to corrosion, maintenance and replacement costs are virtually eliminated. Aluminum never needs painting, keeps its look of quality for years. Other quality features: aluminum conduit is nonmagnetic, which reduces voltage drop; non-sparking for safe use in hazardous locations.

IT COSTS LESS TO INSTALL

OF A QUALITY INSTALLATION!

10-ft. section of 4-inch aluminum conduit weighs only 34 lbs.; steel—98 lbs.

Aluminum conduit can't rust, resists corrosion—saves maintenance dollars.

Aluminum conduit is easy to work with—saves labor, time and money.

KAISER ALUMINUM

THE BRIGHT STAR OF METALS

See "MAVERICK" • Sunday Evenings • ABC-TV Network

HERE'S HOW TO START SAVING MONEY NOW...

SEE THIS MAN BEFORE YOU BID ANOTHER JOB!

HERE'S HOW TO START SAVING MONEY NOW...

The man to see before you bid on another job is your Kaiser Aluminum Electrical Distributor. Compare prices—see how Kaiser Aluminum rigid conduit can give you the competitive edge on any contract.

Your Kaiser Aluminum Distributor has a complete stock of aluminum conduit sizes and fittings—*ready right now for delivery to your job site.*

See or call him today. Ask for a free copy of the Kaiser Aluminum Rigid Conduit Brochure containing comparative weights, installation details, and all the facts you need to lower your costs.

Start saving money now!

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See "MAVERICK" • Sunday Evenings • ABC-TV Network

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Pioneer Electric Dist.

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Pawtucket:
Major Elec. Sup. Co.
Providence:
Leavitt Colson Co.

SOUTH CAROLINA
Columbia:
Capitol Elec. Sup.
Noland Co.
Greenville:
Sullivan Hdwe. Co.

SOUTH DAKOTA
Watertown:
J. H. Larson Elec. Co.

TENNESSEE
Nashville:
Nashville Elec. Sup. Co.

TEXAS
Austin:
Southern Electric Sup. Co.
Dallas:
Rogers Elec. Sup. Co.
Ft. Worth:
Anderson Fixture Co.
Houston:
Gross Electric Supply
Marlin Associates
Southern Electric Supply Co
Lubbock:
Homer G. Maxey & Co.
San Antonio:
Southern Equip. Co.
Strauss-Frank Co.

UTAH
Salt Lake City:
Artistic Lighting

VIRGINIA
Arlington:
Dominion Elec. Sup. Co. Inc.
Noland Co.
Lynchburg:
Mid-State Elec. Sup. Co., Inc.
Norfolk:
Noland Co.
Roanoke:
Noland Co.

WEST VIRGINIA
Huntington:
West Virginia Elec. Co.
Wheeling:
The Front Co.

WISCONSIN
Appleton:
Moe Northern Co.
Eau Claire:
W. H. Hobbs Sup. Co.
Milwaukee:
Luppin Elec. Co.
Standard Elec. Sup.

WASHINGTON
Seattle:
Seattle Lighting Fix. Co.

ALASKA
Anchorage:
Northern Supply Co.

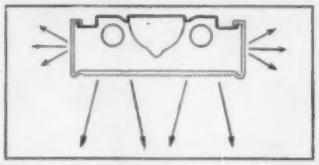
CANADA
Montreal:
L. D. G. Products, Inc.
The Gray Elec. Co.
Union Electric Sup. Ltd.
Quebec City
La Cie Martineau Electric Co.
Toronto:
Revere Elec. Dist.
Toronto Ltg. Studios

HAWAII
Honolulu:
Hawaiian Light & Sup. Co.

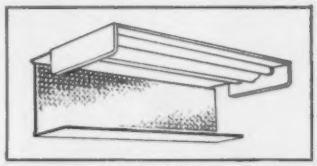
Here's why Top Architects and Engineers Specify

PRISMALUX by LIGHTOLIER

The reasons? Prismalux combines good lighting, rugged construction and simple, pleasing styling. It's quality equipment; it looks it...and will prove itself in trouble-free performance for you and your customers. Lens and diffuser are made in one piece, have a low, wide cross-section that fits contemporary low-ceilinged applications perfectly. In two, three and four light widths, four and eight foot lengths. Installation—stem or surface—is swift, simple, economical.



The fine-textured prismatic lens floods low-brightness illumination downward. The low-brightness diffuser sides send soft light out across ceilings, reduce brightness contrasts.



For maximum rigidity, the combination lens-diffuser is supported along its full length. Safety hinges permit access from either side of lens diffuser, cannot be accidentally dislodged.

To learn more about Prismalux by Lightolier, write today for a complete brochure to Dept. EC-129

LIGHTOLIER

Jersey City 5, New Jersey

Showrooms: New York, Chicago, Dallas, Los Angeles

General Electric announces . . .

NEW DRAW-OUT DESIGN

From General Electric comes the all-new draw-out Limitamp control—today's most advanced medium-voltage motor starter. Designed for the control of a-c motors rated 2300 through 4600 volts and up to 3000 hp, this new air-break starter has broad application throughout industry.

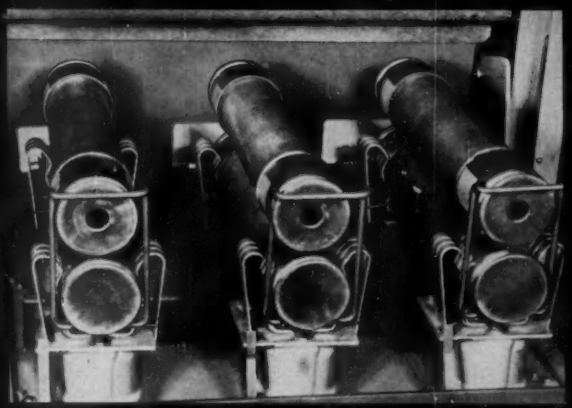
Since its introduction in 1941, Limitamp control has established a reputation for being first with the design features that add up to major user benefits. And, today's all-new Limitamp control follows this pattern with a host of design innovations that make for:

Faster installation: When you're ready to roll in the contactor—it can be done easily by one man. And, there are no connections to make—they are made automatically as the contactor rolls into place. There's plenty of space inside the panel for pulling the motor and power cables . . . and making the connections. And, with the new design, floor sills have been eliminated. This means no more grouting, no expensive cement work, simplified lineup with other panels.

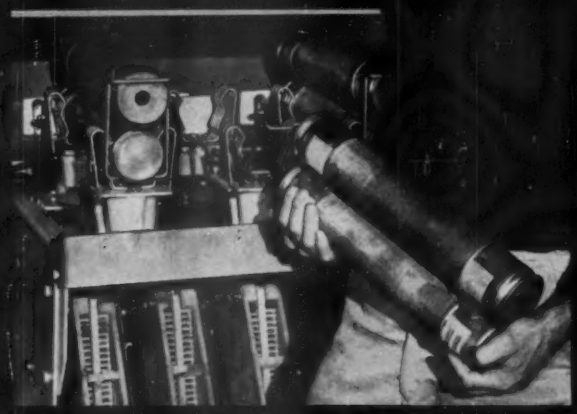
Simpler, safer operation: One handle now controls the complete operation of connecting and disconnecting the starter from the bus and mechanically locking the high-voltage compartment door. A unique interlocking system protects the unit from misuse.

Superior protection: General Electric's new Limitamp

INSTALLS IN HALF THE TIME—Draw-out air break contactor, roomy isolated cable compartments, and increased working space help simplify installation.



LIMITAMP CONTROL IS ISOLATED AUTOMATICALLY—A unique shutter box isolates the starter from high-voltage power when the operating handle is turned to the off position.



INTERRUPTS FAULT IN FIRST ½ CYCLE—Fast-acting, current-limiting fuses interrupt circuit before short circuits cause damage to valuable motors.

NORMAL MAINTENANCE WITH CONTACTOR IN PLACE—All components, including the high-voltage contactor, can be maintained right in the control unit, with complete safety.

LIMITAMP* CONTROL

control utilizes fast-acting current-limiting fuses, ambient-compensated overload relays, and a high-voltage contactor to provide the most "positive" protection for your motors. Proved EJ-2 fuses interrupt a fault in the first ½ cycle, thus reducing damage to valuable motors. The performance of the completely coordinated design has been exhaustively tested in General Electric's high-voltage laboratory to provide the most reliable equipment for your application.

Easier maintenance: Even with these advanced design features, new Limitamp controls are simpler than ever to maintain. All components are accessible from the front for inspection and maintenance—without removing them from the enclosure. A special test circuit is built into each unit—permitting check-out operation before the unit is put into service.

For full information on all-new Limitamp motor control, contact your G-E Apparatus Sales Engineer or Agent today. Or write Sect. 783-10, General Electric Co., Schenectady, N. Y., for Bulletin GEA-6893. Industry Control Dept., Roanoke, Virginia.

*Reg. trade-mark of General Electric Company.

Progress Is Our Most Important Product

GENERAL ELECTRIC

Pan-type diffusers of PLEXIGLAS *in classrooms and cafeteria of Roosevelt Elementary School, Middletown Township, Pa. Diffusers are 1′ x 4′, 2′ x 4′, and 4′ x 4′ in size.*

Plexiglas...for lighting at its best!

When you specify lighting equipment that includes diffusers of PLEXIGLAS® acrylic plastic, you can be sure of:

Freedom from discoloration
Clean, attractive appearance
Highest efficiency in transmission and diffusion of light
Smooth, easily cleaned surfaces
Low surface brightness
High illumination levels

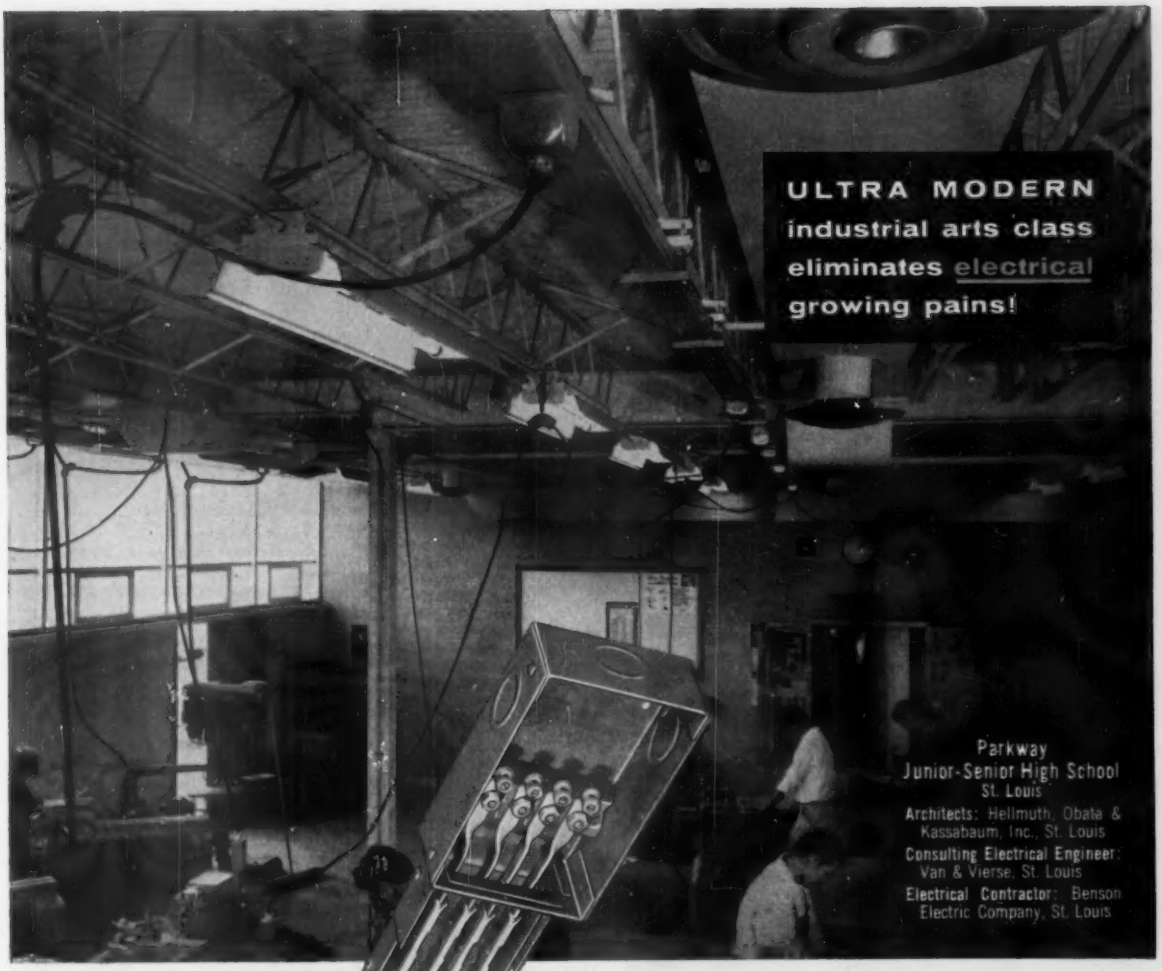
These advantages of strong, rigid PLEXIGLAS add up to *lighting of the highest quality*, for buildings that deserve the best. We will be glad to send you samples of white translucent PLEXIGLAS, and the names of manufacturers who use PLEXIGLAS in their lighting equipment.

In Canada: *Rohm & Haas Co. of Canada, Ltd., West Hill*
Crystal Glass & Plastics, Ltd., Toronto.

Chemicals for Industry

ROHM & HAAS COMPANY

WASHINGTON SQUARE, PHILADELPHIA 5, PA.



FRANK ADAM MIDGET POWERPLUGIN BUSDUCT

Hangers—One for each 5 ft. of busduct. For ceiling or side wall installations.

Plugin Device—Two spring prongs attached to device, catch and lock on the inside of duct to form a rigid support. Also act as ground connection to duct.

Plugin Outlets on 12" Centers—Provide electric power where it's needed, when it's needed. 100 amps., 250 volts or less.

A perfect example of how Frank Adam Midget Powerplugin Busduct keeps pace with the future!

Present classroom equipment can be moved and plugged-in almost as easily as an electrical appliance . . . the busduct quickly relocated if necessary. If additional busduct is needed for future expansion, it can simply be added to the old! Cuts costly rewiring—keeps electrical downtime to a minimum.

For an economical and versatile electrical power supply that will stay modern for years to come, specify and insist on quality built Frank Adam Midget Powerplugin Busduct.

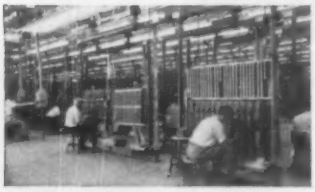
FRANK ADAM ELECTRIC COMPANY
P. O. BOX 357, MAIN P. O. · ST. LOUIS 66, MO.

busduct · panelboards · switchboards · service equipment · safety switches · load centers · Quikheter

UNISTRUT metal framing is used extensively in the 35-acre Automatic Electric plant at Northlake, Illinois, termed one of the handsomest and most efficient factories in the nation. A subsidiary of General Telephone & Electronics, Automatic Electric is the largest manufacturer serving the independent telephone industry.

18 miles of UNISTRUT® metal framing used to speed construction of huge new Automatic Electric plant

UNISTRUT channel is used to support the entire electrical system, from point of entry of 4160 power cables to outlets at benches.



Intense illumination of more than 100 foot candles in testing area is provided by double bank of fluorescent fixtures, supported by UNISTRUT framing.

Entire fluorescent system of 7,120 fixtures is supported with UNISTRUT channel, which also provides a raceway for wiring.

The unequalled versatility of the UNISTRUT metal framing system made it a natural choice for electrical framing, supports, and many other uses in Automatic Electric's huge new plant.

Using the UNISTRUT system, the contractors benefited in many ways. The time and cost of detailed precision layouts were eliminated because continuous slot channel and a complete line of fittings enabled workmen to do precision work on the job.

By standardizing on UNISTRUT materials, the contractor got the advantage of dealing with one local source providing fast service, eliminating the need for ordering and follow-up through several suppliers and fabricators. Since no pre-designing was required, UNISTRUT products were stockpiled at the site and used as needed anywhere in the electrical system.

As versatile as lumber, UNISTRUT framing was also used for a wide variety of other purposes at Automatic Electric, such as building time card racks, pipe supports, storage mezzanines, racks and shelving. It continues to prove its flexibility in the plant, as engineering and maintenance personnel use it to make alterations quickly and easily.

For information on how the UNISTRUT framing system can save time and money on your next project, see your local UNISTRUT distributor.

UNISTRUT®
METAL FRAMING

UNISTRUT PRODUCTS COMPANY

GENERAL OFFICES: 933 W. Washington Blvd., Chicago, Ill.
Telephone: MOnroe 6-2665 Teletype: CG 1329

Stocking distributors in all principal cities of the United States and Canada. Exported throughout the world.

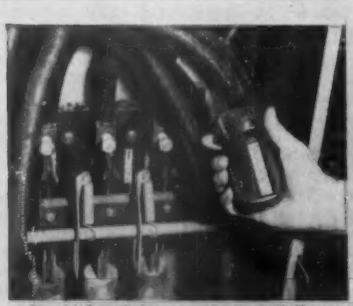
Emil Gabriel says: *

"WE CUT MOTOR-TEST TIME WITH THE AMPROBE RS-3!"

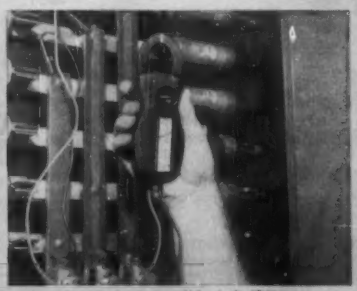
"Ours is a very busy motor-repair shop. With the amount of work we handle, any method of cutting corners is appreciated. One of the best ways of cutting test time we've found is to make sure that *every* man in the shop has an AMPROBE RS-3 snap-around volt-ammeter-ohmmeter. We've been using the RS-3 for some time now, and it saves us time, effort and trouble on every motor job. We wouldn't be without the RS-3!"

Not only do Emil and his men at Queens Electric use the AMPROBE RS-3 but they recommend it to their customers for plant maintenance. Yes, thousands of electricians, servicemen and plant maintenance men everywhere have discovered that the all-purpose AMPROBE RS-3 handles 99% of all their test needs... accurately and safely. It meets every commercial voltage requirement on three voltage scales... 0-150/300/600 VAC; gives accurate current readings from 0 to 300 amps on five current ranges; takes resistance readings as low as 0.5 ohms. *Cut motor-troubleshooting time – mail coupon today!*

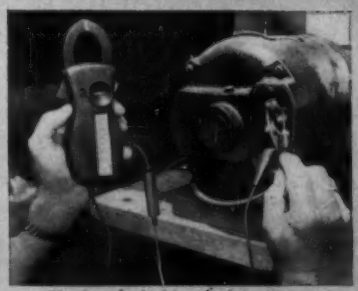
*Veteran shop foreman, Queens Electric Motors, Long Island City, N. Y.



Check phase balance on new installations



Check for low-voltage conditions



Check unmarked terminals on meters

AMPROBE RS-3

Pyramid Instrument Corp. Dept. T-3.
630 Merrick Road, Lynbrook, L. I., N. Y.
I'd like to know more about how Emil and his men use the AMPROBE RS-3. Please send me detailed story.

Name_____

Address_____

City_____ Zone____ State____

6 bonuses

bonus NO. 1 . . . EXTREME QUIETNESS

Quiet transformer operation with low loss is a blessing and a real source of satisfaction to building owners, managers, top executives, employees and patrons. Therefore a superior low noise level is an extremely important reason why you should specify and/or install PTC transformers on all jobs.

Look at these PTC low noise levels as they compare with present and recommended NEMA specifications.

KVA Transformer Rating	Present NEMA	Precision Average Sound Level Standard Design	Special Design
9–30	50	40	34
37½–112½	55	42	38
125–167	60	44	42
200–300	62	48	46

To recognize the extreme quietness of PTC transformers it is best to compare them in decibel sound level ratings with those of typical sounds familiar to everyday life.

FOR EXAMPLE:

60-70 decibels—the sound of one typewriter or average traffic sounds 100 ft. away.

50-60 decibels—the sound of a vacuum cleaner or moderate restaurant clatter.

40-50 decibels—the noise to be found in an average residence or in normal conversation.

30-40 decibels—low conversation in a residence in the evening.

bonus NO. 2 . . . EFFICIENCY

Transformer losses cost money. Precision transformer cores ❶ use the lowest loss steel available. Precision transformers are wound with low resistance copper wire and designed for the greatest possible operation economy. These features reduce losses and save dollars not once, but year after year.

bonus NO. 3 . . . OVERLOAD CAPACITY

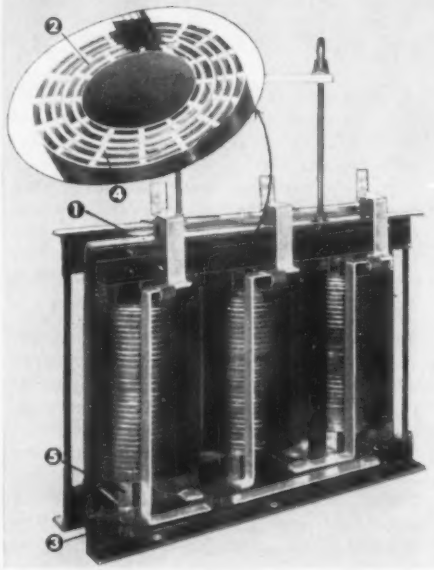
Precision transformers are designed with large open ducts ❷ for efficient cooling and operate at lower temperatures than specified in national standards. Superior PTC insulation materials, varnishes and wire enamels actually permit operating temperatures in excess of these standards with no loss of life. These factors together with low losses give Precision transformers unequalled ability to handle overloads.

bonus NO. 4 . . . DEPENDABILITY AND LONG LIFE

Dependability and long life can result only from ADVANCED DESIGN and BUILT-IN QUALITY. PTC transformers excel because they are constructed to meet the varying conditions under which they must be used. Additional PTC features are:

- Core laminations are clamped together with structural steel ❸ rather than formed sheet steel for more rugged construction.
- Glass laminate duct spacers ❹ used provide greater toughness, rigidity, dimensional stability, and moisture resistance far in excess of wood or paper phenolic laminate spacers.
- Coils are thoroughly clamped and braced around the core with fibre-glass laminate insulating blocks ❺ resulting in greatest structural and tensile strength.
- Coils are made with an interlayer and interwinding insulation of Mylar-Quinterra and glass, assuring high dielectric strength, low moisture absorbtion and high temperature stability characteristics.

when you specify and/or install PTC TRANSFORMERS



bonus NO. 5...REDUCED INSTALLATION EXPENSE

Well designed and easily accessible mounting provisions together with ample connecting space and simple wiring termination mean neater installations at lower than normal cost.

bonus NO. 6 . . . THE ONLY 5-YEAR UNCONDITIONAL GUARANTEE IN THE INDUSTRY

Your reputation as an electrical engineer or contractor depends upon YOUR ability to stand firmly behind your recommendations and installations.

It is reassuring to know that PTC transformers work because PTC people make them work — then stand unconditionally behind them.

WHISPER-QUIET INSIDE-THE-WALL INSTALLATION

Precision Transformer Corporation has developed a unit which installs *inside-the-wall* in otherwise unusable space. Precision's "HUSH-FLUSH" design permits easy, full accessibility, lowest noise level close to lead power service. Saves material and labor costs. Ideal for schools, libraries, hospitals, churches, theatres, etc. — wherever noise *must* be eliminated.

Complete Line—DRY and LIQUID Type

Whatever your transformer needs, there is a dependable, quiet, long-lasting dry or liquid type transformer . . . more than 4,000 models ranging from ¼ to 5,000 KVA.

Write today for 4-page brochure providing details on the PTC line.

PTC TRANSFORMERS
- QUIET
- EFFICIENT
- DEPENDABLE

PRECISION TRANSFORMER CORP.
2222 West Lake Street • Chicago 12, Illinois
Representatives in all principal cities

During our periodic fire drills at Gillette, a Gamewell fire alarm system has proved itself much faster, much more trouble-free than the one it replaced. We appreciate the excellent protective value of the Gamewell system and your aid in engineering it to cover all buildings in our plant area.

Howard P. Spaulding
Chief Electrical Engineer
Gillette Safety Razor Co.
Gillette Park, Boston, Mass.

At Gillette it's GAMEWELL

. . . industrial leader installs the leading fire protection system

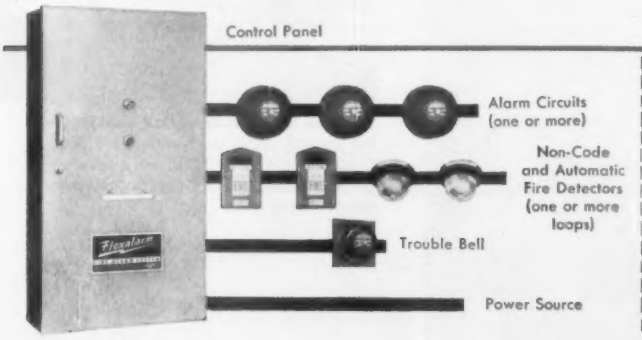
The Gamewell system endorsed by Engineer Howard Spaulding was carefully designed to protect all lives and property in Gillette's 11 buildings — headquarters of the internationally known manufacturer of razors, blades and other products.

A Gamewell system can be engineered to safeguard your own business from fire losses — including not only irreplaceable human lives but buildings and equipment that can't be renewed at their original costs. It will warn all personnel, signal your local fire department and, if required, will include fire detection units that activate the entire system — instantly — automatically.

Ask your Consulting Engineer about these advantages. Also, a Gamewell Fire Protection Engineer will be glad to give you details about installation requirements, performance and price. Send the coupon below for this service and/or a Gamewell technical manual — without obligation.

Gamewell

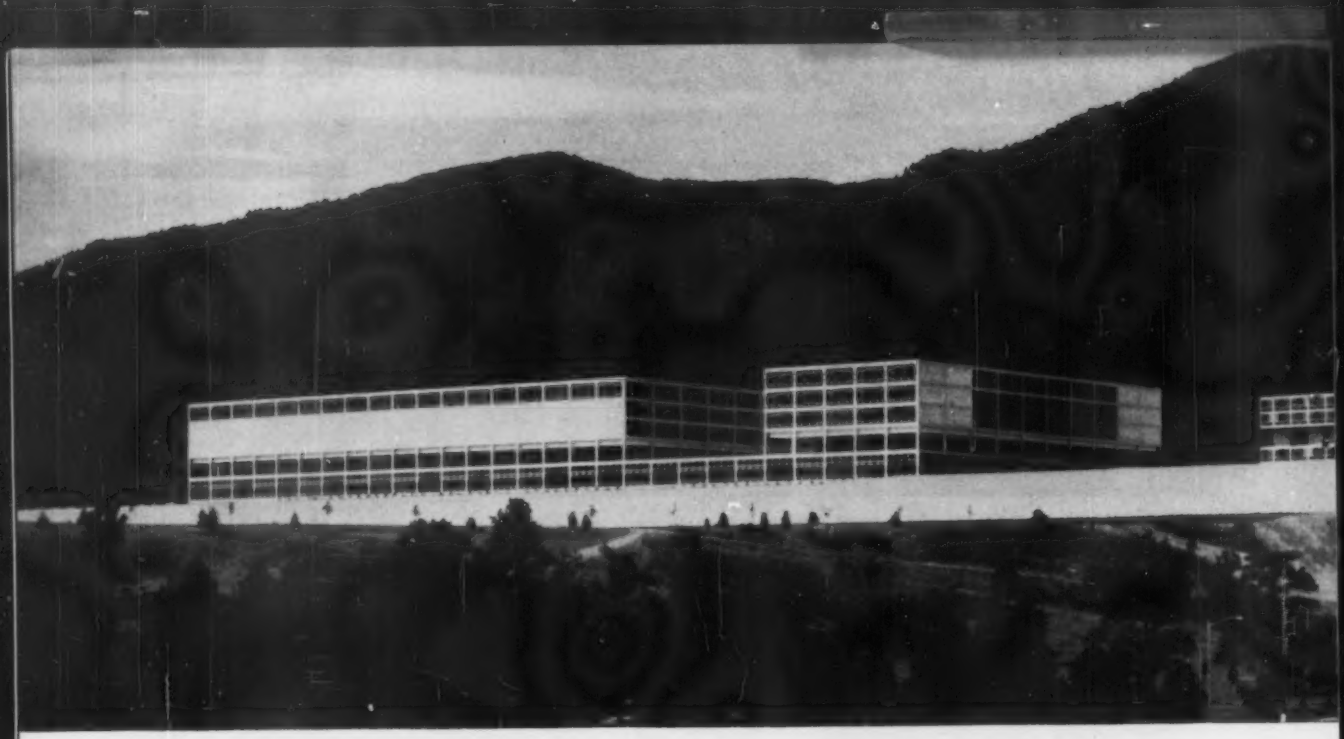
FIRST . . . WHEN SECONDS COUNT!



GAMEWELL COMPANY
1313 Chestnut Street,
Newton Upper Falls 64, Mass.

☐ Have a Gamewell Fire Protection Engineer call
☐ Send me a Gamewell Fire Alarm System Planning Guide

Name.....
Title.....
Firm.....
Address.....
City.....*Zone*....*State*.....



United States Air Force Academy, Colorado Springs . . . dramatically positioned with the Rampart Range of the Rocky Mountains as a backdrop.

Architects & Engineers: Skidmore, Owings & Merrill.

Electrical Engineer: Syska & Hennessy, Inc.

Fairchild Hall where open floors give a semblance of flight. The outside corridors are illuminated by special corner fixture troffers using lenses to direct light outward.

Cafeteria in the headquarters building in the service and supply area. Here flush mounted troffers with curved lenses assured a pleasing lighting effect of low brightness luminescence.

A monument to tomorrow...

The Air Force Academy

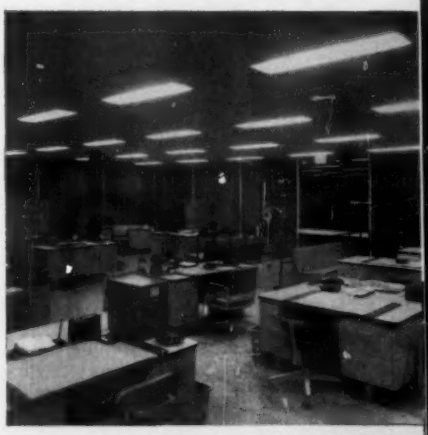
Complemented by AllBrite Lighting in Keeping with the Space Age

A calvacade of contrast . . . that's the Air Force Academy near Colorado Springs.

Buildings of aluminum, glass and white marble in military order seem to march down a mesa of broad terraces. There are buildings within buildings, separated by courts. All in all, there is earthbound strength in their precise arrangement. Yet, a sense of air and flight permeates structures that stand on stilts. Here and there floors are left completely open. Colored walls of glass mosaic read as vertical planes to add illusion of height.

This feeling of the future challenged imagination in illumination so unusual effects were sought. In one instance open floor areas were illuminated by special AllBrite corner troffers using lenses which gave light an outward direction, adding to the semblance of flight. In another, an office area was bathed in low brightness luminescence to create an unusually restful atmosphere. This was achieved by AllBrite troffers with curved lenses.

Thus did architects Skidmore, Owings & Merrill wed lighting to the total design concept of a monument to tomorrow . . . and with special skills and products AllBrite engineering served the architects well. Curtis-AllBrite Lighting, Inc., AllBrite Lighting Division, 352 Shaw Road, South San Francisco, California; Curtis Lighting Division, 6135 West 65th Street, Chicago 38, Illinois.



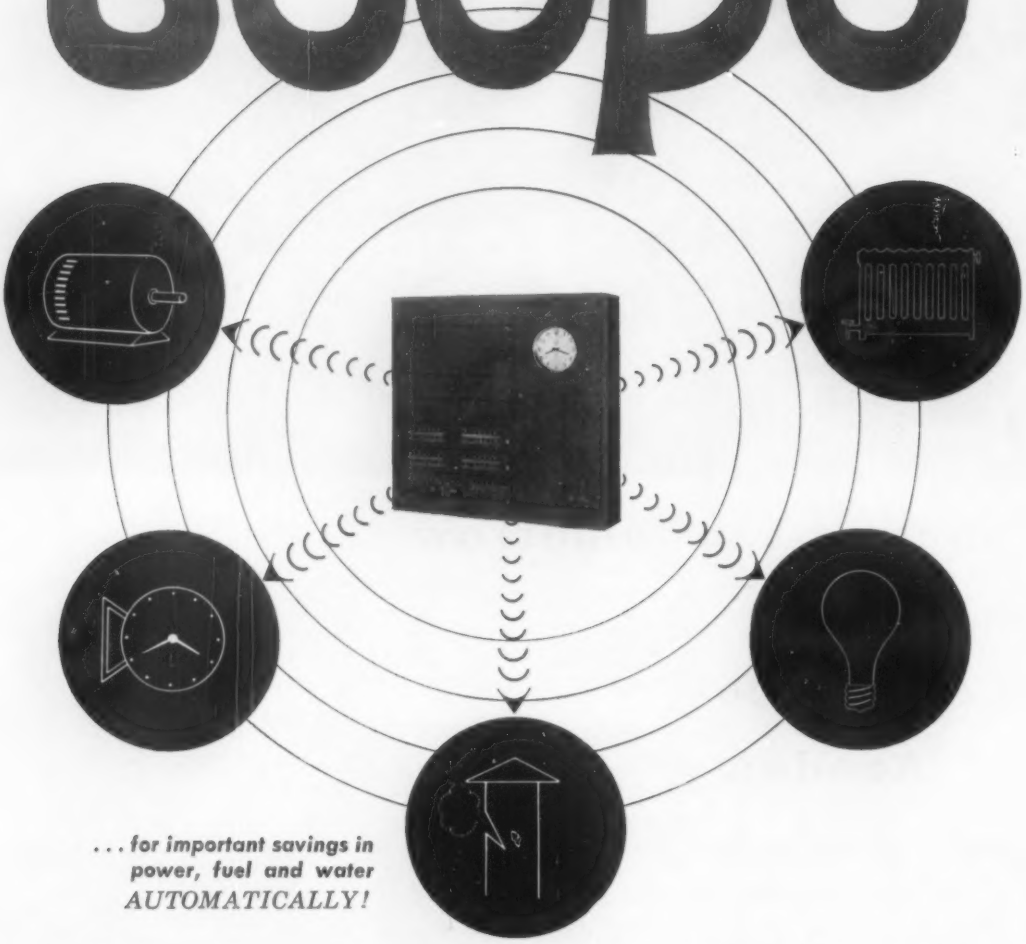
East end of the headquarters building in the service and supply area. Lighting was achieved by troffers with curved lenses which assured an unusually restful atmosphere.

CURTIS

visioneers in planned lighting

All-Brite

scope



. . . for important savings in power, fuel and water AUTOMATICALLY!

SCOPE, the new Stromberg Central Operations Panel Electronic, contains a Stromberg master clock, automatic programming equipment and manual control panels. It *conserves* power, fuel and water—actually *lengthens the life* of operational equipment.

SCOPE times the "on" and "off" operation of remote utility functions and equipment *without* special or additional wiring. It initiates "command" signals through an electronic transmitter. Coded pulses sent over normal 60 cycle wiring energize coded receivers or relays which supervise the utility functions being controlled. Manual controls permit SCOPE operation at unscheduled periods.

With SCOPE, fuel, water and power consumption can be precisely balanced against actual requirements. The "on" and "off" operation of equipment can be pre-determined for optimum cost control in schools, offices, plants, stores and public buildings.

In any standard installation, SCOPE will supervise clocks, audible signals, time recorders and the programmed control of lighting centers, heating and air conditioners, ventilators, conveyors, compressors, pumps, valves and motors.

A complete catalog—TIME AND SIGNAL EQUIPMENT—prepared especially for Architects and Engineers—is yours for the asking.

Stromberg TIME CORPORATION

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GT GENERAL TIME SUBSIDIARY OF GENERAL TIME CORPORATION

Sales & Service Offices throughout the U. S. A.

Another new development using

B.F.Goodrich Chemical *raw materials*

TOUGH JACKET OF GEON

protects direct burial wire

Direct burial wire made by Superior Cable Corporation with a jacket of Geon is also used for aerial constructions where burial is not practical. Geon vinyl materials are supplied by B.F.Goodrich Chemical Company.

Designed for use in outside buried plant, this wire must withstand severe mechanical and chemical stresses both during installation and service. That's why its jacket is made from Geon vinyl.

Geon is tough. Insulation compounds made from it are strong, abrasion-resistant and have excellent flexing properties. They resist flame, will not support combustion and are not affected by ordinary causes of corrosion—like oil, grease, chemicals or galvanic action. They retain these exceptional properties with age. They are lightweight, make wire easy to install or splice.

For more information about the many types of wire and cable covering made of Geon, write Dept. AU-5, B. F. Goodrich Chemical Co., 3135 Euclid Avenue, Cleveland 15, Ohio. Cable address: Goodchemco. In Canada: Kitchener, Ontario.

A TRADE MARK OF B.F.GOODRICH CHEMICAL COMPANY

Geon

VINYLS

A DIVISION OF THE B.F.GOODRICH COMPANY

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B.F.Goodrich

GEON polyvinyl materials • HYCAR rubber and latex • GOOD-RITE chemicals and plasticizers

SAFE and SURE

the tape of the experienced electrician

EVERY splice you make must be *final, permanent* and *safe.* SLIPKNOT PLASTIC TAPE is engineered for *dependable* adhesive quality and *proper* stretch to insure a neat, tight wrap that molds to any irregular shape and *stays down.*

And Slipknot's patented, exclusive cutter, packed free with every 66-foot roll, solves the handling problem — swiftly, handily, easily. No waste . . . no distortion . . . no effort.

Next time, *specify* SLIPKNOT PLASTIC ELECTRICAL TAPE from your distributor.

SOLD ONLY THRU RECOGNIZED DISTRIBUTORS

PLYMOUTH RUBBER COMPANY, INC.
QUALITY SINCE 1896 CANTON, MASSACHUSETTS

McGILL®

Levolier®

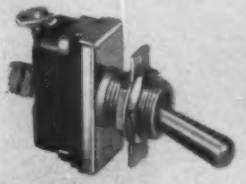
electrical specialties are

BUILT BETTER

to # LAST LONGER

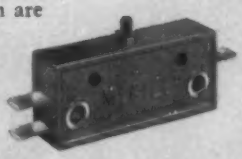
UNCONDITIONALLY GUARANTEED

The McGill No. 41 Levolier switch is unconditionally guaranteed against failure in lighting circuits. 6 amp. "T" 125 V. 3 amp. 250 V.



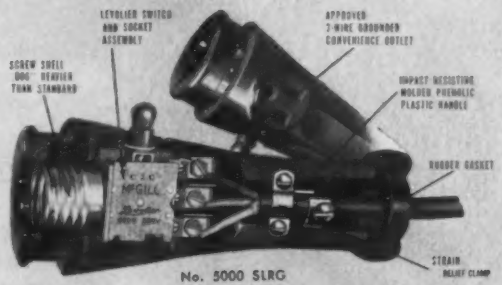
McGILL LEVOLIER SWITCHES

The same high standards of material selection and workmanship that make it possible for McGill to guarantee the No. 41 Levolier switch are applied to all McGill products. Levolier universal lever, toggle, momentary contact and special use switches from 3 to 20 amps have set performance records in a wide variety of uses. All are Underwriters' Laboratories, Inc. inspected.



McGILL PORTABLE LAMP GUARDS

McGill Lampguards are designed and built to withstand rugged industrial service. Top quality and careful workmanship assures a safe dependable light; where you want it, when you need it. Over 100 different types available including Grounded, Vapor Proof, and a variety of types of cages, handles and sizes.



No. 5000 SLRG

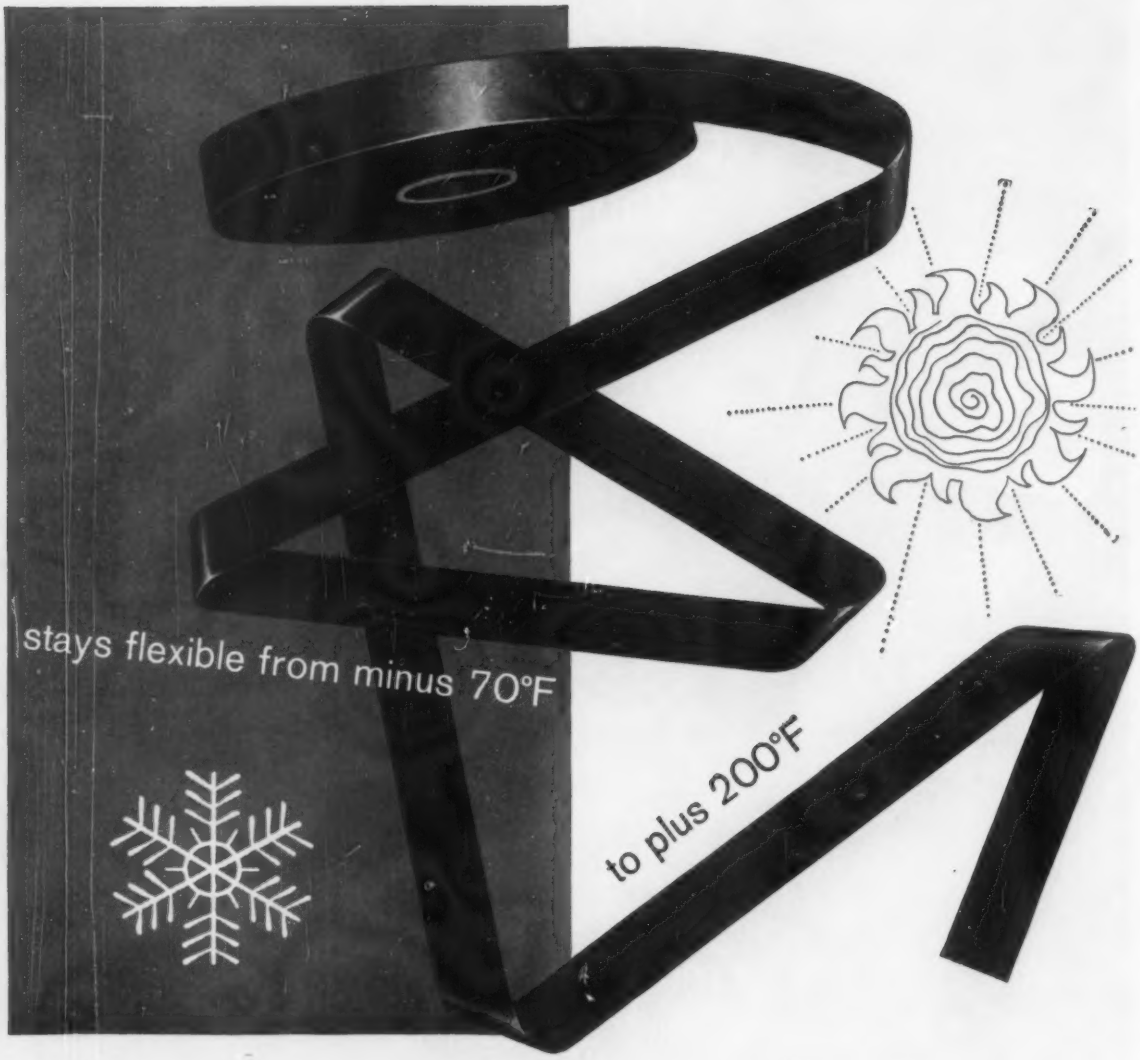
WRITE FOR McGILL ELECTRICAL SPECIALTIES CATALOG NO. 84

engineered electrical products

McGILL®

precision needle roller bearings

McGILL MANUFACTURING COMPANY, INC., ELECTRICAL DIV., 450 N. CAMPBELL ST., VALPARAISO, INDIANA



Porter® QUIK-STIK POLYETHYLENE ELECTRICAL TAPE

- **Ideal for all outdoor and indoor, underground or overhead wiring, in utilities, electronics, aircraft, automotive, and general use.**
- One-wrap, single-wind primary insulation.
- Permanent strong tack . . . fast-sticking anywhere!
- Dielectric strength tested to 1,000 volts per mil; uniform power factor over wide frequency range.
- Low moisture-permeability, high abrasion- and corona-resistance.
- Resists acids, alkalies, oils, solvents, fungus, bacteria, gases.

Get full information on Porter Quik-Stik polyethylene tape by writing today to *Thermoid Division, H. K. Porter Company, Inc., Tacony & Comly Sts., Philadelphia 24, Pa.*

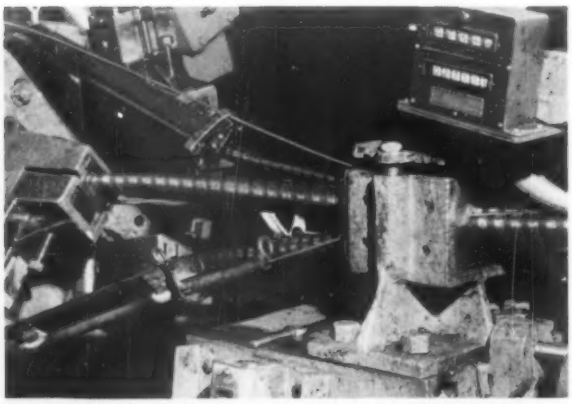
THERMOID DIVISION **PORTER** ***H.K. PORTER COMPANY, INC.***

PORTER SERVES INDUSTRY: with Rubber and Friction Products—THERMOID DIVISION; Electrical Equipment—DELTA-STAR ELECTRIC DIVISION, NATIONAL ELECTRIC DIVISION; Specialty Alloys—RIVERSIDE-ALLOY METAL DIVISION; Refractories—REFRACTORIES DIVISION; Electric Furnace Steel—CONNORS STEEL DIVISION, VULCAN-KIDD STEEL DIVISION; Fabricated Products—DISSTON DIVISION, FORGE AND FITTINGS DIVISION, LESCHEN WIRE ROPE DIVISION, MOULDINGS DIVISION, H. K. PORTER COMPANY de MEXICO, S. A.; and in Canada, Refractories, "Disston" Tools, "Federal" Wires and Cables, "Nepcoduct" Systems—H. K. PORTER COMPANY (CANADA) LTD

WHAT'S THE DIFFERENCE IN ELECTRICAL WIRE AND CABLE?

You'll find the difference in

Research and development. American Steel & Wire maintains a large staff of fully qualified engineers whose objective is to improve existing products and develop new ones. This is the key to a successful research program.



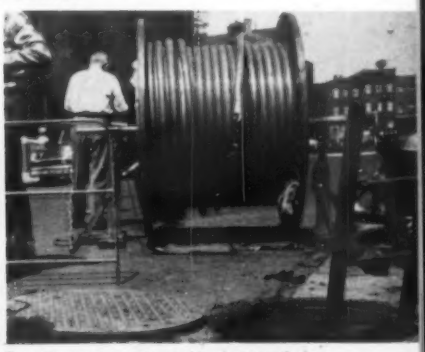
Design Engineering. Cable design is an art in itself requiring ability to combine electrical and mechanical elements to withstand all the destructive forces encountered in service.

Quality Control. From conductor to jacket, every step of manufacture is carefully controlled to make sure you receive the best Tiger Brand Cable for your particular application.

Specially engineered USS Tiger Brand Electrical Cables

For mining machines. Amerclad cables that provide long service in spite of bending, twisting and general hard usage.

For shovels. Cables that operate continuously under the most adverse conditions of weather and abrasion.



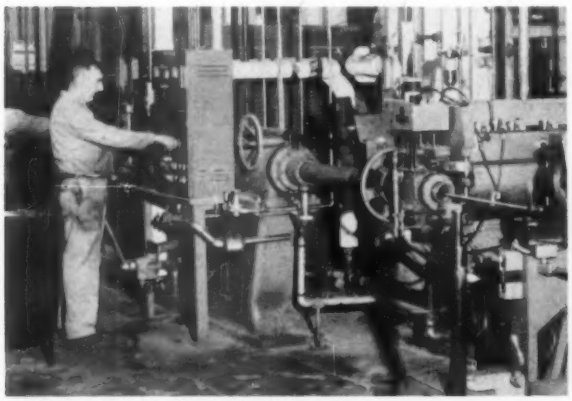
For city power systems. Lead-covered, gas-filled, paper cables for reliable service.

USS Tiger Brand—here's why!

For more than 68 years, American Steel & Wire has been producing the finest quality electrical wire and cable. In this period, we have constantly aimed to improve materials, develop better constructions and use the best cable manufacturing processes. We have two good reasons for doing this; first, our customers demand the most reliable cable they can get, and second, they want the advantages of the latest developments in research, design and engineering.

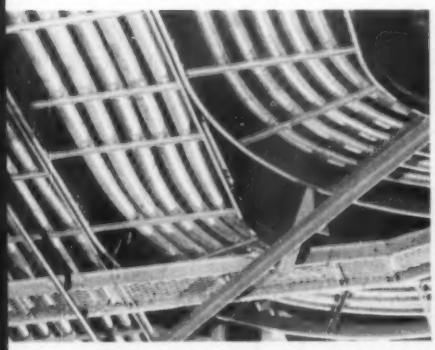
The differences in electrical cable are seldom visible at a glance. They show up, for example, in mining machine cable that absorbs shock and vibration, withstands crushing weights, and severe abrasion for unbelievably long periods. Or they appear in a new irradiated polyethylene cable designed for extra-high resistance to heat and moisture . . . in submarine cables that work under water for 30 or 40 years . . . in power cables that resist corona cutting.

In USS Tiger Brand Cables, you reap the advantages of all the research, engineering skill and manufacturing experience gained in making every type of cable from the smallest control cable to the largest dredge cable. There is a difference in cable—and you'll find it by using Tiger Brand.



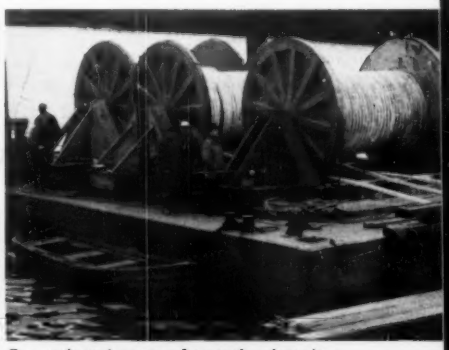
Modern Production Equipment. This new and up-to-date continuous vulcanizer is just one of the many new pieces of precision equipment that result in uniform high quality of USS Tiger Brand Electrical Cables.

Field Engineering. Where specific problems are encountered, our field service engineers are available to help you choose the right cable for the job or to suggest different constructions to obtain better service.



For industrial plants. Armorlokt armored cables eliminate conduit, reduce installation costs.

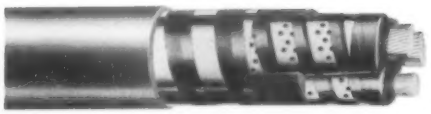
For highway lighting. Type RR power cable resists soil acids in direct burial.



For underwater use. Armored submarine cable supplies dependable power for years.

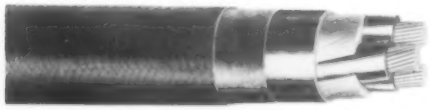
(more on next page)

Quick facts on USS Tiger Brand Electrical Cables



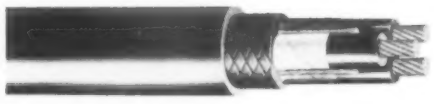
Tiger Brand Paper Cable—Premium quality cable for high voltage use. Regular copper-bearing lead or tellurium lead sheaths available—both protected during manufacture by blanket of inert gas to prevent formation of oxides. All constructions available including neoprene (glass-reinforced) and plastic sheaths.

Tiger Brand Asbestos Cable — Cotton or asbestos braids, lead sheaths or interlocked armor coverings furnished. Available in asbestos or asbestos varnished cambric construction also in the new Type IPE (irradiated polyethylene) construction for extra high resistance to heat and moisture.



Tiger Brand Varnished Cambric Cable—Furnished in braided coverings (for dry installations), lead sheaths (for underground distribution), or armored coverings (for exposed work). Versatile, dependable, rugged, and economical "work horse" of standard insulations.

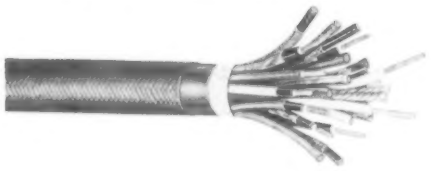
Tiger Brand RR Cable—Rubber-insulated neoprene sheath. A versatile cable for control and power applications. Both "conduit and duct" or "direct burial" (heavy jacket) types are available. Many constructions, including self-supporting aerial cable, can be furnished.



Tiger Brand Amerclad—The very highest quality in heavy-duty portable cords and cables. All jackets are vulcanized in a lead sheath, and are permanently marked with molded identifications. Over-all neoprene jackets show phenomenal resistance to abuse, sunlight, grease, oil or acid mine water.

Tiger Brand Submarine Cable—Special marine insulation, used on leadless armored cables, has over 40 years of proven operation in all types of underwater service. American Steel & Wire pioneered the use of aluminum armor for salt water installation.

Tiger Brand Interlocked Armor Cable — Aluminum, bronze, galvanized or stainless steel armor furnished over any type of insulated core. Features higher current carrying capacity (cable in free air), ease of installation and maintenance, and space saving. Rubber or varnished cambric insulations are standard.



Tiger Brand Elevator Cable—Carefully designed to insure the right amount of flexibility for smooth, straight trailing. Annunciator, control, signal, or lighting cables with braid or neoprene covers can be furnished, with steel supporting strand added for high-rise elevators.

For more detailed information, get in touch with American Steel & Wire, 614 Superior Ave., N.W., Cleveland 13, Ohio.

American Steel & Wire Division of United States Steel

Columbia-Geneva Steel Division, San Francisco, Pacific Coast Distributors
Tennessee Coal & Iron Division, Fairfield, Ala., Southern Distributors
United States Steel Export Company, Distributors Abroad

Mr. Contractor:

Guessing is for Games...

Not for choosing wire connectors -- the most critical part of your wiring job!

No electrical system is any better than its poorest connection. Can you *ever* afford to risk a splice that's less than the best—for your customer, the job and *your profits?*

Look at it this way: Just one bad-splice call-back can cost you more than 1000* perfect IDEAL "Wire-Nuts". That's one reason why *more* "Wire-Nuts" are used by *more* contractors than any other connector. Quality-proved by more than 33 years of on the job experience, with *billions* now in service, they constitute visible proof to your customer of the extra safety and quality "built-in" to your wiring installations . . . You can pay *much* more, but you can't get a better, longer-lasting connection at any price. On every job, BE SAFE and STAY SAFE with IDEAL "Wire-Nuts"

* The extra safety and security of 1000 "Wire-Nuts" costs as little as $13.10 *total!* Can you make a call-back for less?

All contractor sizes are listed as pressure cable connectors, for general use (600 V) in branch circuit and fixture wiring.

"Wire-Nuts" don't just join wires, THEY CRUSH 'EM TOGETHER IN A LIFETIME GRIP

Screw-and-lever and wedge action with FORCE UP TO 2½ TONS flattens wires and multiplies contact area.

SHAKE-PROOF! PULL-PROOF! FLASH-PROOF! HEAT-UP PROOF!

You Know You're Safe with

IDEAL WireNuts® CONNECTORS

Sold through AMERICA'S LEADING DISTRIBUTORS

In Canada: Irving Smith, Ltd., Montreal

IDEAL INDUSTRIES, INC., 1041-L Park Avenue, Sycamore, Illinois

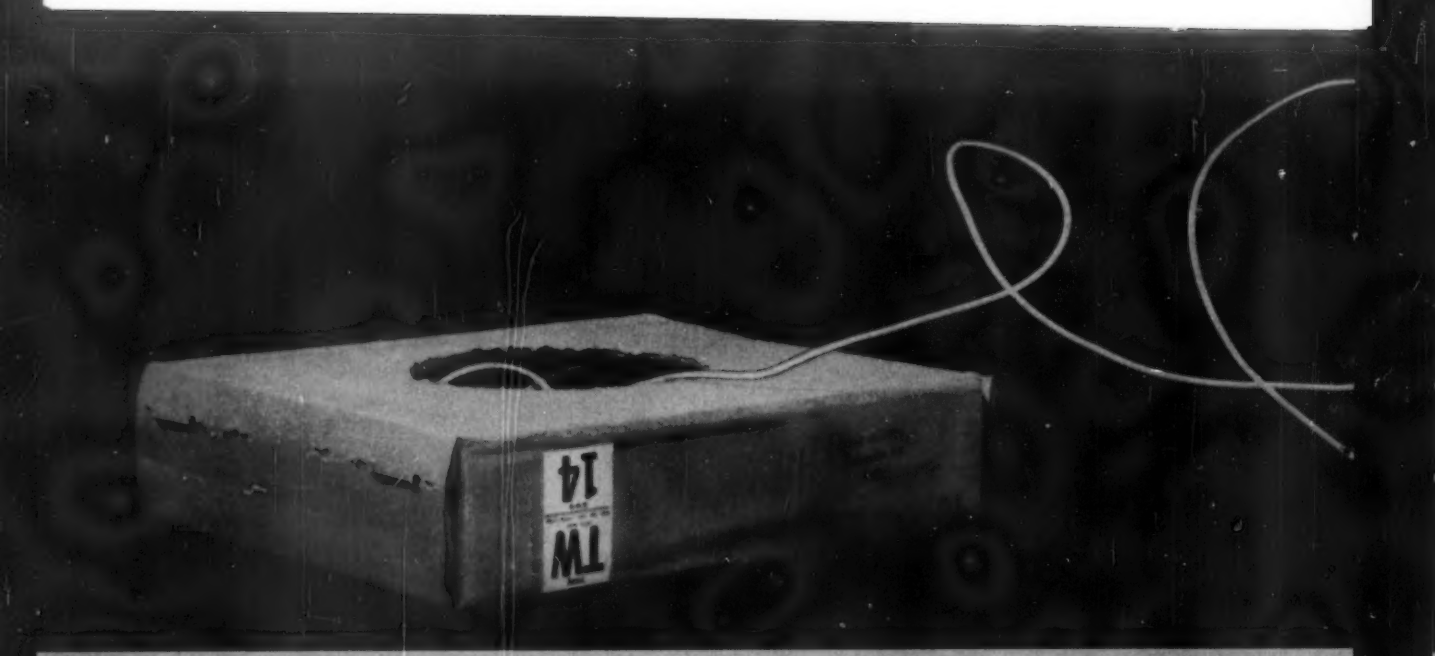
Please send full catalog data on IDEAL "Wire-Nuts"

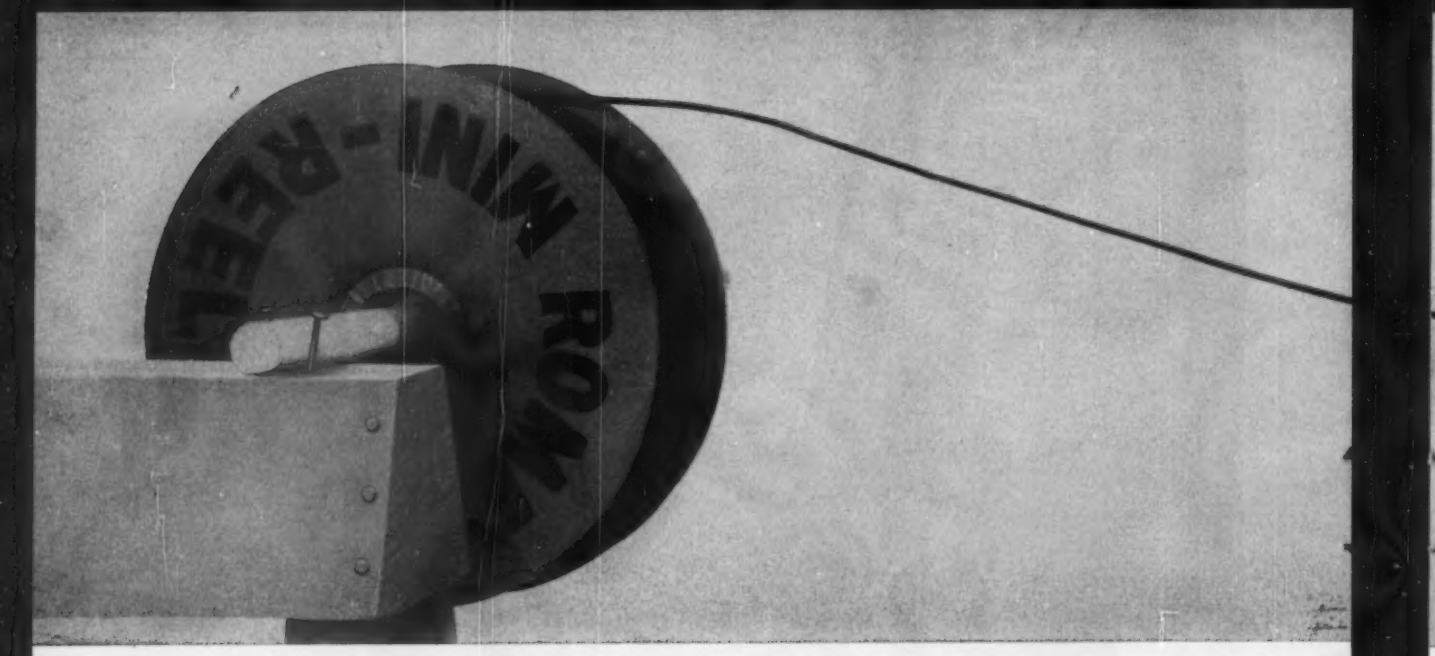
Name_____

Company_____

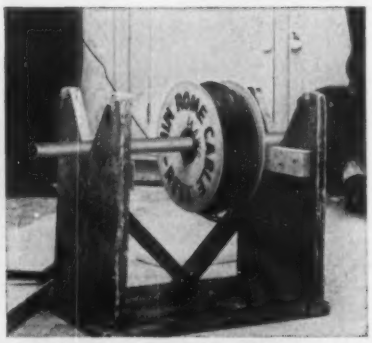
Address_____

City_____ Zone____ State_____

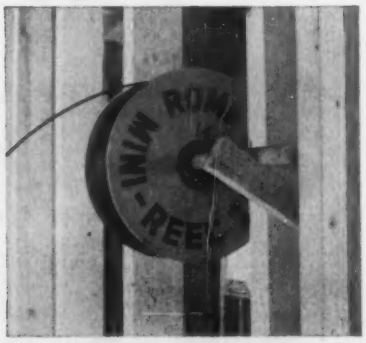




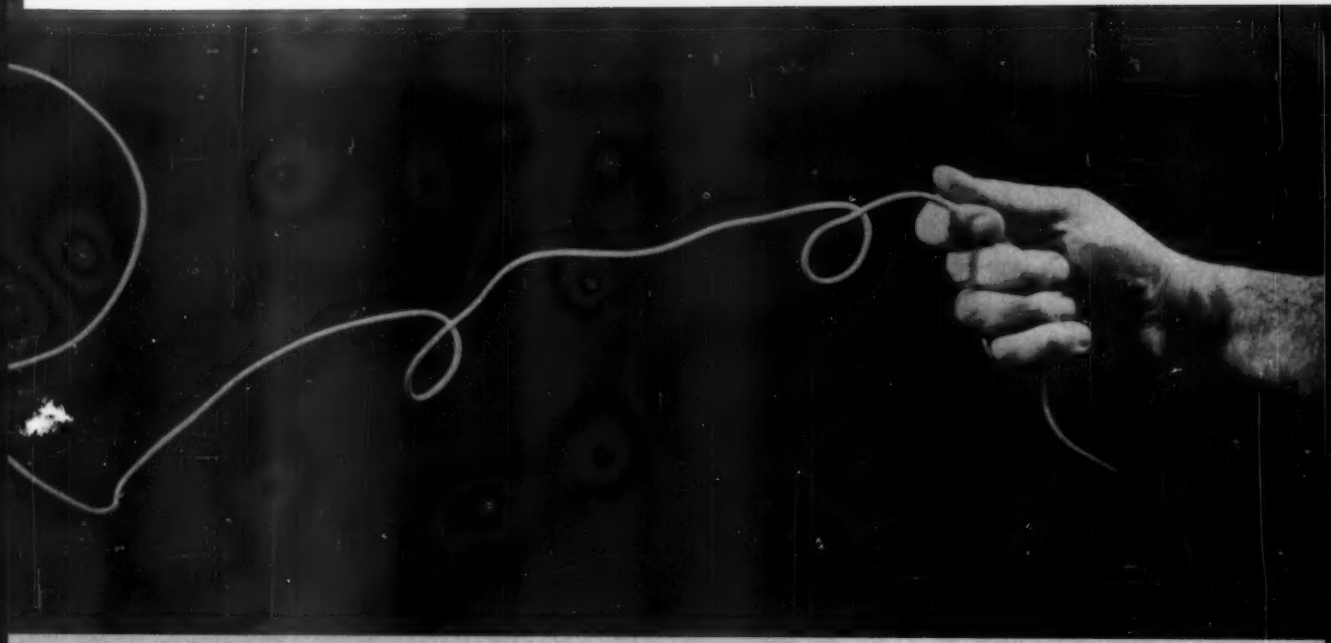
EASY TO OPEN. Just pull the rip cord on carton. One reel holds 1000 feet of No. 14 or No. 12 Solid Type TW.

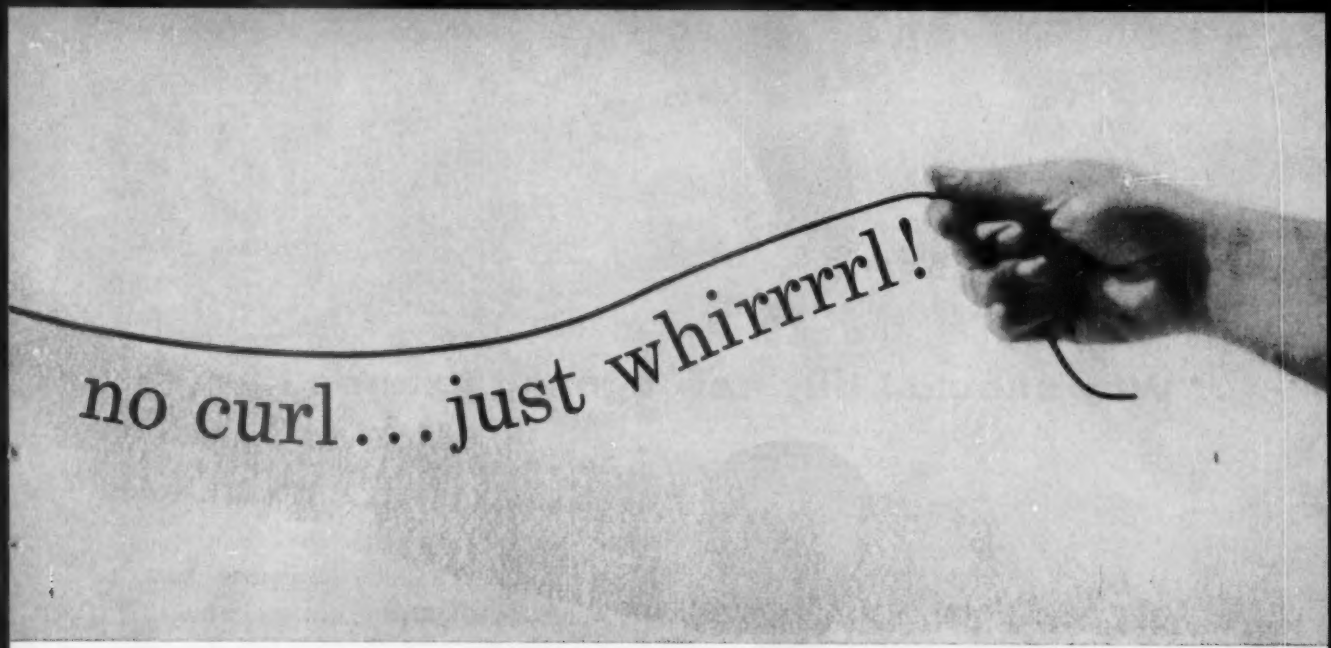


EASY TO USE. Insert a pipe or piece of conduit through center of MINI-REEL and mount it on any suitable rack.



UNLIMITED USES. Mounted on studs right at the job site, it's ready for quick use. Possibilities are endless.





MINI-REEL . . . A NEW PACKAGING IDEA FROM ROME!

Who do *you* think will finish the job first?

The man who works with twisted wire, pulling from the center of a standard coil, or . . .

The man who unwinds wire that can't kink or twist as it comes off Rome's new MINI-REEL?

Answer: the second man does the job faster with MINI-REEL! Installation is safer, too—there's less chance of damaging the wire.

You can get Rome Synthinol in eight standard colors of No. 14 and No. 12 Solid Type TW in this new MINI-REEL package at no extra cost!

You can unwind several reels at once in paralleling conductors for control circuits and other jobs. Respooling any excess is easy.

Because MINI-REEL is so compact, you save shipping and storage space, too! This new package holds a 1000-foot length of wire in the same size carton used for 500-foot lengths. One man can stack and load the same footage in less time than required for 500-foot packages. Just one "tag end" per 1000 feet saves scrap, besides.

Ask your Rome salesman for the MINI-REEL package the next time you need No. 14 or No. 12 TW. Or write to Rome Cable Corp., Dept. 712, Rome, N. Y.

ROME CABLE
DIVISION OF **ALCOA**

"Why should I buy new lighting fixtures?"

How do you convince a re-lighting prospect that his illumination is not as good as he thinks it is? Silvray has developed a simple, dramatic technique ... *the Mirror Test.* It quickly demonstrates the glaring deficiencies (literal as well as figurative) of outmoded lighting fixtures. For details of a complete "easy selling" plan featuring the ILC principle (Indirect Luminous Ceiling) merely send the coupon below.

Send me complete information on your new plan to help us find and sell re-lighting prospects.

TO
SILVRAY LIGHTING
INCORPORATED
100 West Main Street, Bound Brook, N. J.
Dept. 12E

NAME_____

COMPANY_____

ADDRESS_____

Lightweight!
Corrosion-resistant!
Competitive in cost!

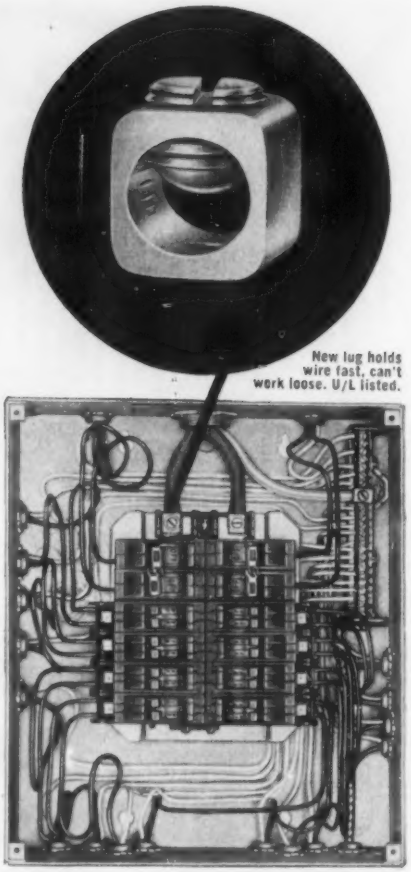
Reynolds Aluminum Electrical Rigid Conduit cuts both installation and maintenance costs. It's light in weight, thus easier to handle, faster to install. It's easy to work with—bends and forms quickly and accurately. It won't rust—ever. It's non-magnetic. It will not spark from accidental contact with hard objects.

For more information and names of Reynolds Aluminum Conduit outlets, call your nearby Reynolds Sales Office or write *Reynolds Metals Company, Box 2346-ET, Richmond 18, Virginia.* Also write for descriptive brochure.

Watch Reynolds TV shows—**"ALL STAR GOLF", "BOURBON STREET BEAT"** and **"ADVENTURES IN PARADISE"—ABC-TV**

U/L LISTED

NEW! LUGS FOR BOTH COPPER AND ALUMINUM WIRE

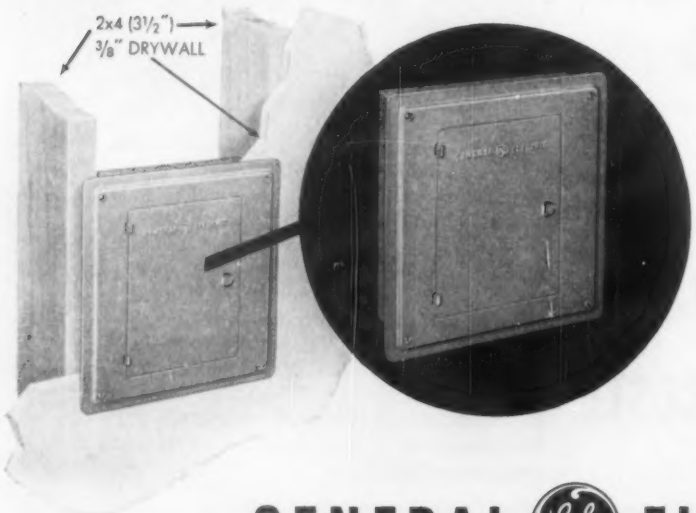


All General Electric load centers (100† and 200 amp.) and fuse pullers (100 amp.) are now U/L listed for both copper and aluminum wire—thanks to the new lug shown above which is standard on these devices *at no extra cost.*

Add this feature to the many advantages of G.E.'s new "twin" breakers and you'll see why more and more contractors are switching to General Electric for highest quality at the lowest cost. The "twin"* lets you put two quality breakers in the space you usually take for one, use a smaller load center, and realize big savings on every job.

† Except TRM Series *Trade-Mark

New G-E flush-front load centers fit flush even with 3/8" drywall



Here is a complete new line of flush-mounted General Electric "twin" load centers to answer your demands for equipment which fits flush with 2" x 4" studs and ⅜" drywall construction.

Ask your G-E distributor to show you the new *flush-front* load centers. Like all General Electric load centers, they feature Snap-Out interiors and provide automatic front alignment—even if the box is installed slightly off plumb.

GENERAL ELECTRIC

Circuit Protective Devices Dept., Plainville, Conn.

ALL NEW!

Now! A new "Super Tape" for cold weather and heavy-duty uses

"SCOTCH" Brand Electrical Tape No. 88 is an all new plastic electrical tape 20% thicker than ordinary plastic tapes. It was specially developed to be a "super" tape for the toughest jobs—is super conformable under all climatic conditions. Even in cold weather, the extremely stable plastic backing retains easy handling properties and feel; the high-tack adhesive sticks at a touch and grips firmly. And the extra-tough flame retardant backing provides excellent resistance to abrasion, puncture, flame, acids, alkalies, oil, and weathering. For complete information, just clip and mail the coupon.

Electrical Products Division

"SCOTCH" AND THE PLAID DESIGN ARE REGISTERED TRADEMARKS OF 3M CO., ST. PAUL 6, MINN. EXPORT: 99 PARK AVE., NEW YORK 17. CANADA: LONDON, ONTARIO.

MINNESOTA MINING AND MANUFACTURING COMPANY

...WHERE RESEARCH IS THE KEY TO TOMORROW

3M Co., 900 Bush Ave.,
St. Paul 6, Minn., Dept. EAA-129

Please rush me complete information on your new cold-weather tape, "SCOTCH" Brand No. 88 Electrical Tape.

NAME_____

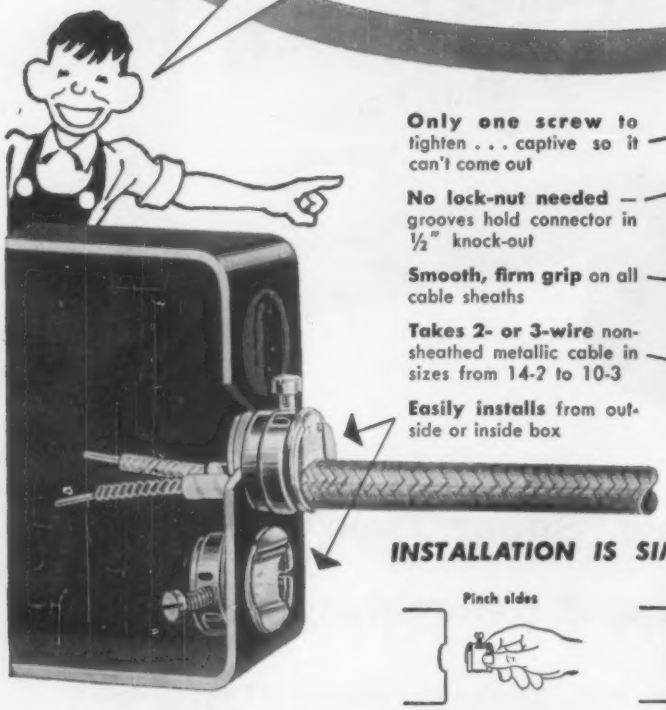
COMPANY_____

ADDRESS_____

CITY_____ ZONE____ STATE_____

MAKE INSTALLATION JOBS
EASIER, MORE CONVENIENT...

Only T&B ENGINEERED 2020* connectors have all these cost-saving features!



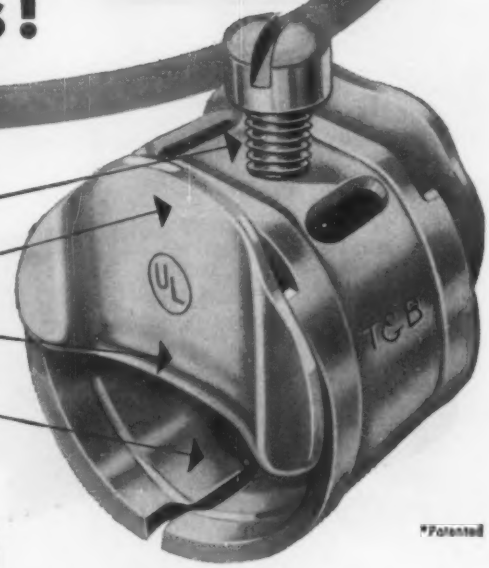
Only one screw to tighten . . . captive so it can't come out

No lock-nut needed — grooves hold connector in ½" knock-out

Smooth, firm grip on all cable sheaths

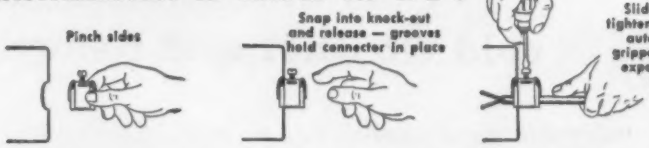
Takes 2- or 3-wire non-sheathed metallic cable in sizes from 14-2 to 10-3

Easily installs from outside or inside box



*Patented

INSTALLATION IS SIMPLE AS A B C



T & B 2020's are steel snap-in type connectors for non-metallic sheathed cable. With an easy squeeze, the "2020" snaps into a ½" knock-out and is held fast by grooves. Because this connector installs from either inside or outside the junction box, it is especially good for work on old buildings where damage to walls and floors can be avoided by working from inside the box.

T & B 2020 Connectors have full Underwriter's Laboratories approval. They hold any non-metallic sheathed cable sizes 14-2 to 10-3; 2- or 3-wire cables, also portable cords, etc. – work especially well on currently popular small dimension plastic sheathed cables. Write for samples and descriptive literature.

LOOK FOR THIS SIGN — T&B ENGINEERED

IT'S THE MARK OF AN AUTHORIZED T & B DISTRIBUTOR

The complete line of T & B fittings for conductors and raceways is sold only by recognized electrical wholesalers. It's our way of assuring you the service and savings of a friendly local source. Call him for all your electrical needs. T-510

THE THOMAS & BETTS CO.

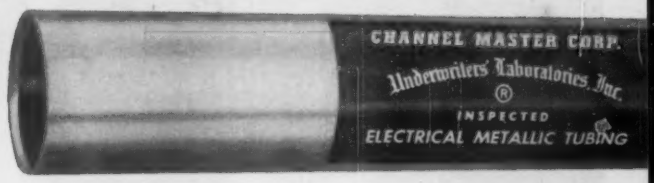
INCORPORATED

34 Butler Street • Elizabeth 1, New Jersey

Thomas & Betts Ltd., Montreal, P.Q., Canada

MANUFACTURERS OF FINE ELECTRICAL FITTINGS SINCE 1898

CHANNEL MASTER ALUMINUM EMT



lightens the load... brightens the job... and never shows its age!

Light-weight aluminum cuts the cost of shipping, storage, and handling. ⅓ the weight of steel. New flat bundle simplifies stacking and storing.

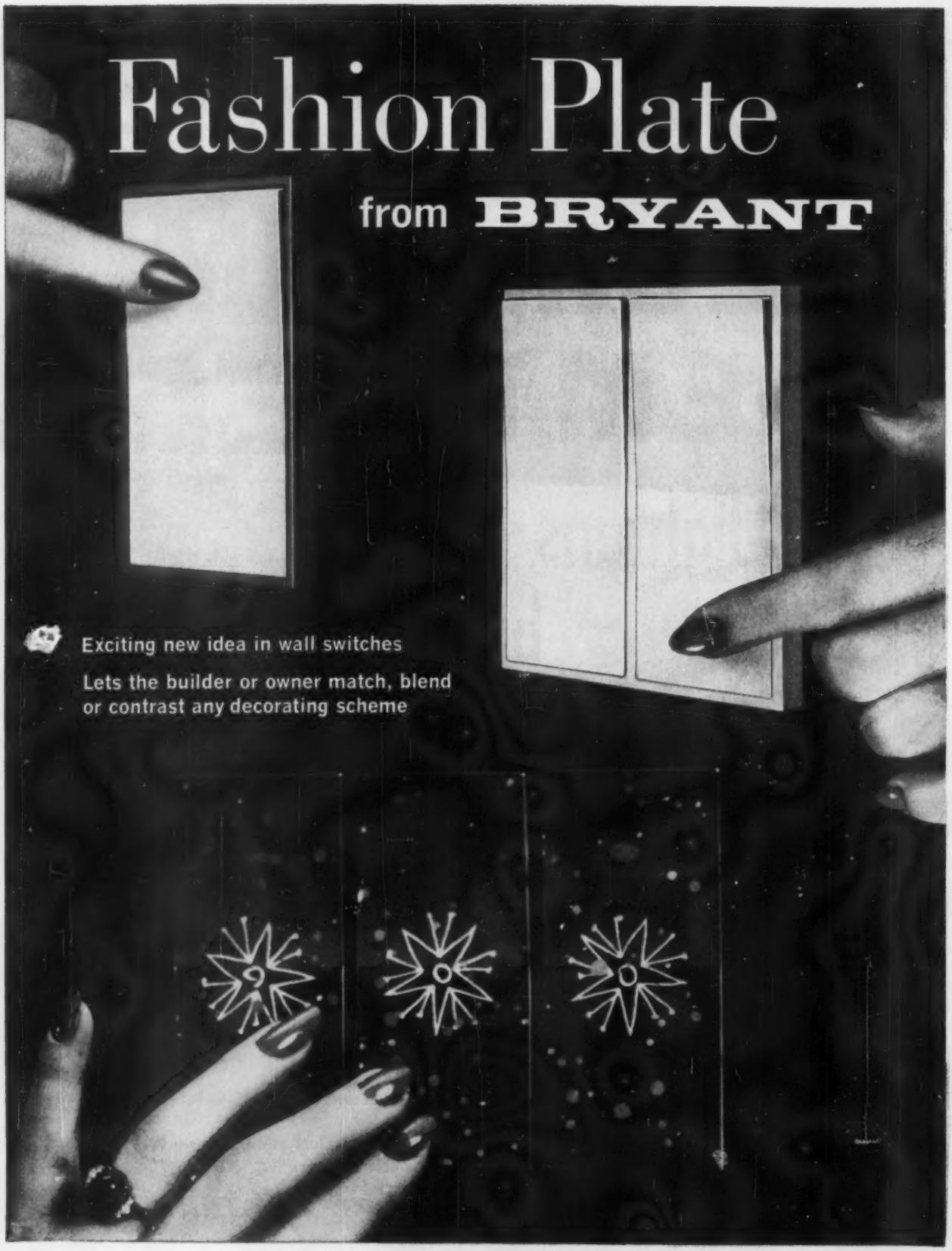
The swing is to ALUMINUM

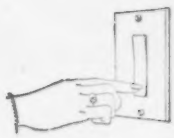
. . . for faster, better looking installations . . . at lower cost. Available from your regular distributor.

Nothing can take the place of feather-weight ALUMINUM

- ★ Aluminum stays good-looking... mirror bright, mirror smooth... inside and out... won't ever show its age.
- ★ Channel Master aluminum EMT is extruded and drawn, *not* welded: has no seams or "beads".
- ★ Hard-drawn, highly polished, seamless raceway facilitates fishing and wire-pulling.
- ★ Can never rust. Unaffected by water, humidity, and industrial atmospheres.
- ★ Standard inside and outside diameters. Uses standard EMT fittings.
- ★ Speeds up the job. Cuts and bends up to 40% faster. Use on any standard bender.

CHANNEL MASTER CORP.
ELLENVILLE, NEW YORK


Fashion Plate
from BRYANT
Exciting new idea in wall switches
Lets the builder or owner match, blend
or contrast any decorating scheme



TAP-EEZ . . . new tap-action, flush-mounted switch for buildings, institutions and stores. Rugged enough for all a-c applications, yet much more attractive than ordinary switches.

WINS NEW CUSTOMERS . . . CAPTURES MORE BUILDER DOLLARS

Fashion Plate opens the door to more business in new construction . . . for homes, buildings, institutions . . . brings you a bigger share of the total building dollar

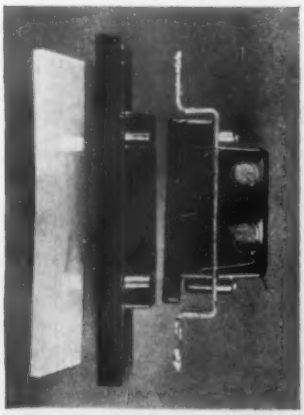
There's real excitement about Fashion Plate* among builders and architects. They are taking a second look at wall switches. That means you'll see Fashion Plate in more and more specifications . . . in more and more new homes and buildings. And you are the one who profits.

Right now, builders all over the nation are being supplied with a brand-new merchandising package for Fashion Plate. And they are being sent to you to supply their wiring needs.

Don't wait. Stock up now before the big building rush this summer. Next job you wire, suggest Fashion Plate. It's an exciting new product that wins customers and builds profits.

*Trade-Mark

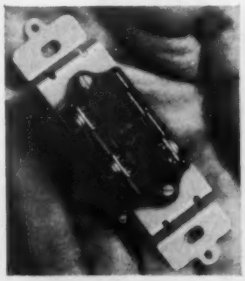
ASK YOUR BRYANT DISTRIBUTOR for a sample of Fashion Plate. Take it apart and see the built-in quality . . . the trade-mark of Bryant superior wiring devices.



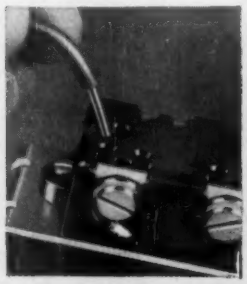
Smooth, quiet action. Low installation cost. Just press on back plate and actuator.

UNLIMITED APPLICATIONS—AVAILABLE IN SINGLE, DOUBLE AND THREE GANG COMBINATIONS—WITH CLEAR OR IVORY ACTUATORS, BLACK OR WHITE BACK PLATES

Silver alloy contacts insure long life. Positive controlled contact action. Listed by Underwriters' Laboratories, Inc.



Compact design. Fits standard switch boxes. Requires no special wiring.



Time-saving, clamp-type, back wiring terminals make installation quick and easy.

Fashion Plate

the exciting things come from

BRYANT

THE BRYANT ELECTRIC COMPANY, BRIDGEPORT 2, CONNECTICUT

J-59024

2515 *

3401 *

3213-I *

CIRCLE F WIRING DEVICES

136 *

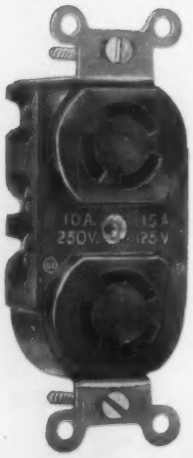
2035 *

3650 *

585 *

2517 2516 *

864-SO *



2632 *

whatever your ***wiring device*** *needs . . .*

CIRCLE F devices give you everything you want—and you save money, too! High quality, low cost Circle F wiring devices provide fast, easy installation, trouble-free service and eliminate call-backs. Precision engineering and quality-controlled production plus rugged construction guarantee customer satisfaction. Circle F devices are available at Electrical Wholesalers everywhere for quick pick-up or delivery.

*Only one of a complete line. For additional information, write for catalog.

CIRCLE F MFG. CO.

TRENTON 4, NEW JERSEY • For your wire requirements: Eastern Insulated Wire Corp., Box 591, Trenton, N. J.

Balance... the measure of cable superiority

Every brand of cable *must* have certain important electrical characteristics. But not every brand will have these characteristics in the *same* relative proportions... and it's this fact that makes a difference in cable life and performance. Look at these significant test results.

	BRAND			
	CAROL	A	B	C
Electrical Insulation Resistance (1)	100	17	16	68
Cold Bend °F (2)	—50	—45	—90	—50
Abrasion Resistance (1)	91	62	100	92
Ozone Resistance (1)	100	6	18	12

Note: (1) 100 indicates best—others % of best (2) cold bend—actual test temperature

Note how, in Brands A, B and C, there is a marked lack of *balance* between abrasion resistance and ozone resistance. This means that these cables can crack long before they wear out. Also, it is quickly apparent that needlessly high cold flexibility may be built into a cable... *but at the sacrifice of more important electrical properties.*

But Carol cable, in addition to having the highest *combined* rating, is also the best *balanced*... with primary emphasis on the characteristics most vital to cable life and performance. The *balance* built into Carol cables is your assurance of superior quality *throughout*... *extra* quality and performance where it is most needed.

When you call for cable—call for Carol!

PORTABLE CORDS • POWER SUPPLY CABLE • CONTROL CABLES • WELDING CABLE • GOVERNMENT TYPES • CORD SETS

Sports lighting requires a combination of short-range and long-range floodlights to provide good visibility for participants and spectators, and to add dramatic effect. Economical Revere Eliptor floodlights on Revere hinged poles illuminate this race track. Revere "2000" Series long-range, rear-serviced floodlights are mounted on the grandstand roof to increase intensity of illumination at the finish line.

Solve any outdoor lighting problem with Revere's complete, matched line

Peak lighting efficiency for any outdoor lighting application calls for a number of components, each designed to do a specific part of the job. Solving outdoor lighting problems is much easier when you install Revere equipment because—

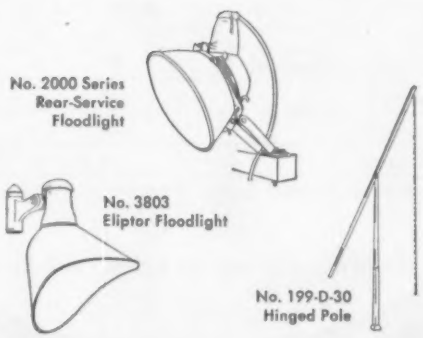
1. Revere offers the widest line, making it easy for you to select the exact combination of components to solve *any* outdoor lighting problem. Everything you need from one reliable source simplifies ordering, assures on-schedule delivery of all components.

2. Revere offers matched components . . . *structurally* matched for strength, balance, and perfect fit; *design* matched for peak lighting efficiency and best appearance.

3. Revere offers easier installation—lights, poles and accessories are made for each other. Installation is fast, easy, trouble-free.

Write for Revere's catalog of outdoor lighting equipment. You can solve any outdoor lighting problem with this complete, matched line.

Revere components used to light race track



Revere ELECTRIC MFG. CO.

OUTDOOR LIGHTING

Revere Electric Mfg. Co. • 7420 Lehigh Avenue • Chicago 48, Illinois (In suburban Niles)
Long Distance Phone: NIles 7-6060 • Chicago Phone: SPring 4-1200 • Telegrams: WUX Niles
In Canada: Curtis Lighting, Ltd., Leaside, Toronto, Ontario

New RIDGID® No. 141
Geared Threader for 2½", 3", 3½", 4" Pipe and Conduit

One Set of Dies!

JAM-PROOF!

New Cam-Action Workholder!

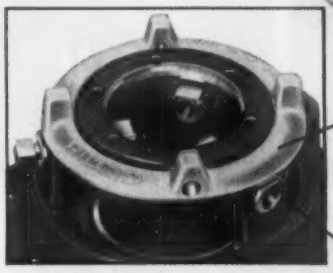
No. 141

Save Time . . . Cut Costs on all large threading jobs

1. **Only 1 Set of High Speed Dies** threads 2½", 3", 3½" and 4" pipe and conduit. No extra die sets to change or lose! Die size change plate sets quickly and locks at desired size. Easy adjustment for tapered, straight, over or under size threads.

2. **Jam-Proof** for safe power or hand threading. Drive pinion kicks out automatically. Die head **Can't Jam** causing costly repairs and delay.

3. **New Fast-Action, Cam-Type Workholder** sets to size by quick turn of collar. Set screw holds work centered for perfect threads every time.



Pat. Appl'd. For.

No. 161

For 4", 4½", 5" and 6" Pipe and Conduit, Buy the New RIDGID No. 161 Geared Threader!

- Only 1 Set of High Speed Dies
- Jam-Proof
- New Fast-Action, Cam-Type Workholder

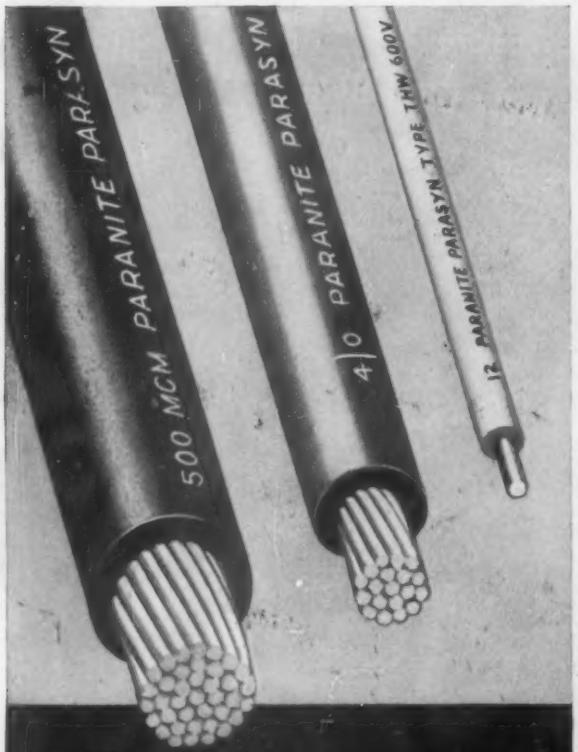
See and buy these work-saving RIDGID Threaders at your Supply House!

RIDGID

The Ridge Tool Company, Elyria, Ohio, U.S.A.

PARANITE THW and RHW

Two types available for 75°C wet or dry specified applications

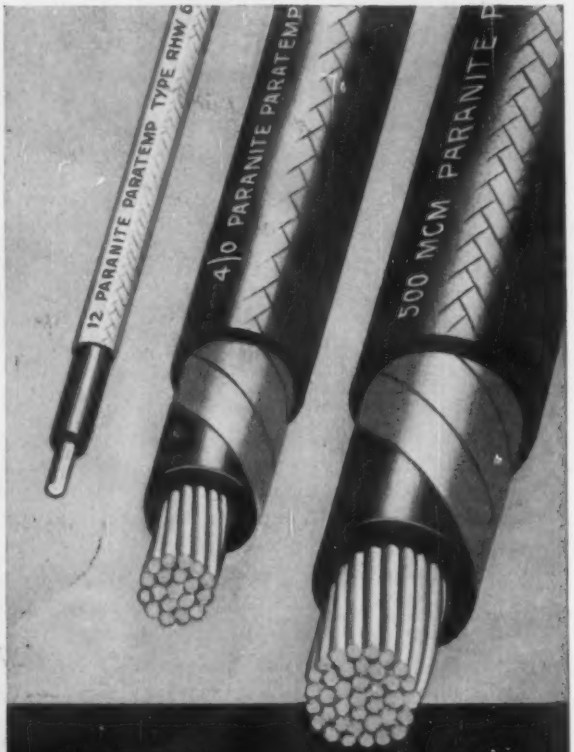


NEW! PARASYN® TYPE

THW

THERMOPLASTIC INSULATED
600 V BUILDING WIRE

New UL listed 75°C building wire for wet or dry applications. Specially formulated Paranite vinyl insulation. Small diameters, slick silicone finish, color availability and stripping ease all contribute to reducing handling costs!



MYLAR TAPED*
PARATEMP® TYPE

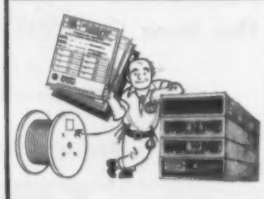
RHW

600 V BUILDING WIRE

Taped with * Dupont "Mylar" (AWG 6 and larger) to provide an improved moisture barrier with higher dielectric strength. Resulting diameter reductions, better fit conduit. Saturated and impregnated, braided sheath, lubricated with special waxes to reduce pulling resistance.

Both UL listed 75°C wet or dry location

Here are two improved building wire products—both offering you outstanding performance in similar installations. Standard colors available from stock in both solid and stranded, sizes 14 AWG through 500 MCM for the THW . . . and 14 AWG through 1000 MCM for the RHW. Get acquainted with advantages of both wires—write today for complete technical information!



Each Carton packaged to reduce handling and labor cost with "color-coded" labels plainly showing type, size and color of wire. Also, new reel cards for instant identification and inventory control.

PARANITE WIRE AND CABLE DIVISION

Essex Wire Corporation, Marion, Indiana

Sold only through recognized electrical distributors

MANUFACTURING PLANTS: Marion, Ind.; Jonesboro, Ind.; Tiffin, Ohio; Anaheim, Calif.

Sales Offices and Redistribution Warehouses in all Principal Cities

EASIER TO DO... and costs less too!

B-M
INDENTER FITTINGS and TOOLS

Here is the combination that is unbeatable when it comes to easier E.M.T. installation at less cost. New lightweight plier size indenters make setting up thin wall conduit a breeze. B-M fittings are neater too! No unsightly nuts or projecting set screws.

A few more of the plus features of B-M fittings are Concrete tight—Vibration resistant—Extra heavy bright zinc plate, salt spray and acid drip tested for corrosion resistance—Extra heavy positive bonding locknuts—Smooth rounded edges or bushed throat type connectors that prevent insulation damage—All steel construction with extra heavy gauge wall thickness.

Red Throat
BM-21B
½" Connector

Red Throat
BM-22B
¾" Connector

Red Throat
BM-23B
1" Connector

BM-41
½" Coupling

BM-42
¾" Coupling

BM-43
1" Coupling

BM-51
½" Offset Connector

BM-21
½" Connector

BM-22
¾" Connector

BM-23
1" Connector

BM-No. 600
Changeable Jaw Indenter

BM-No. 1000
Handvise for ½", ¾" and 1" E. M. T.

BM-No. 100
Cutter for ½", ¾" and 1" E. M. T.

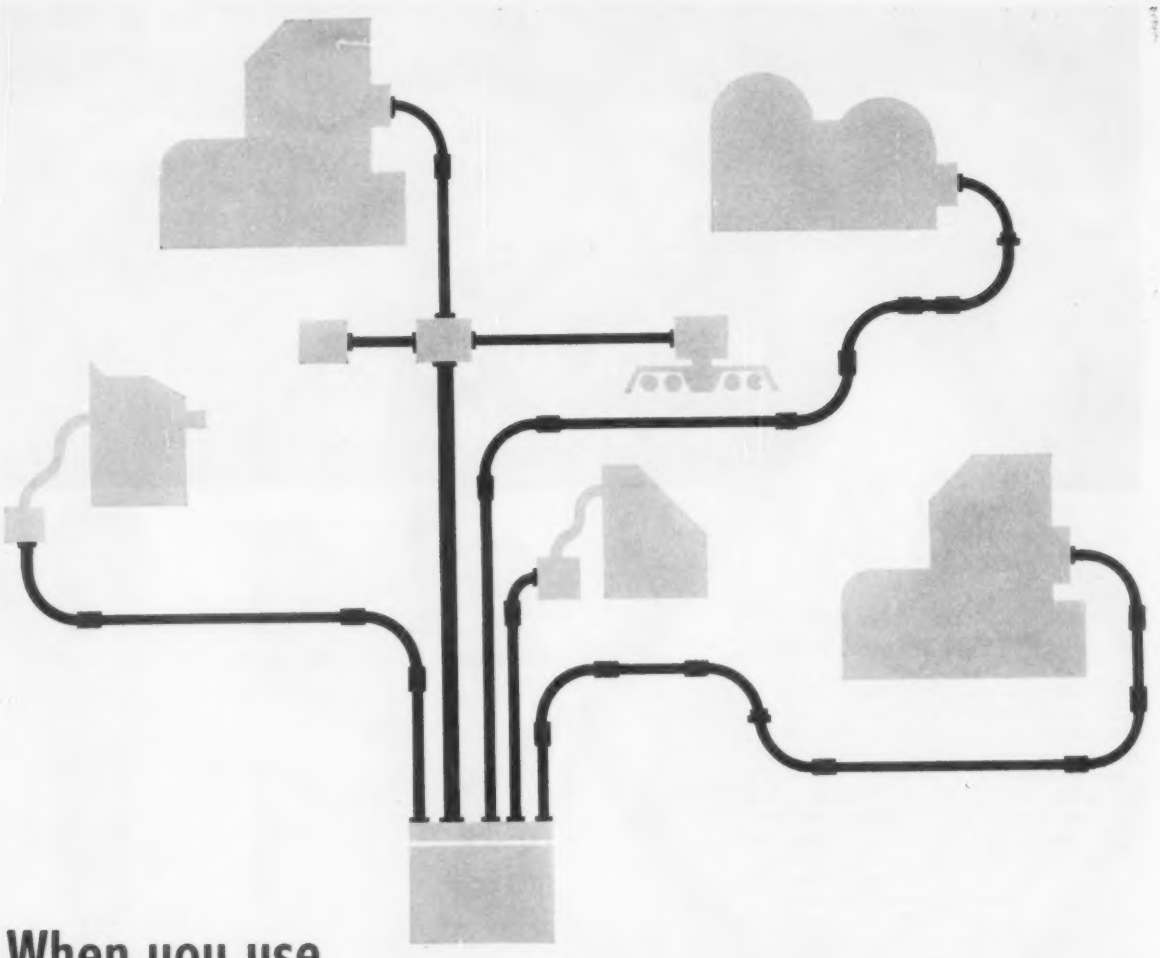
BM-No. 607
½" Indenter
BM-No. 608
¾" Indenter

UL

TELESCOPE BM SYSTEM

All B-M indenter type fittings far exceed the requirements of U. L. file card E 10863 and Federal Specifications W-F-406.

BRIEGEL METHOD TOOL CO.
GALVA • ILLINOIS



When you use RIGID STEEL CONDUIT protection is permanent

Rigid steel conduit has offered builders the greatest protection at the minimum cost for more than half a century. *And it still does:* Steel is the only conduit material available today which gives permanent and near-to-total protection against the hazards inherent in any electrical wiring system: open circuits, short circuits, and induced circuits.

STEEL GIVES YOU STRENGTH AND TOUGHNESS. Steel protects wiring from physical damage both during and after installation.

STEEL GIVES YOU OVER-ALL ECONOMY. Low original cost, low installation cost, and trouble-free service for the life of the building.

Steel means maximum and permanent protection for the wiring system and for the building. You can be sure only when you use rigid steel conduit—proved by dependable service in millions of installations. Your conduit distributor has full details.

BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.

Export Distributor: Bethlehem Steel Export Corporation

BETHLEHEM STEEL

BETHLEHEM STEEL

This is what you can SAVE...

That's right! The electrical engineer for a leading contractor figured this: You can save as much as 630 feet of wire and 160 feet of conduit in lighting a 50' x 54' area, using fixtures equipped with Certified CBM ballasts.

when fixture BALLASTS wear this emblem..

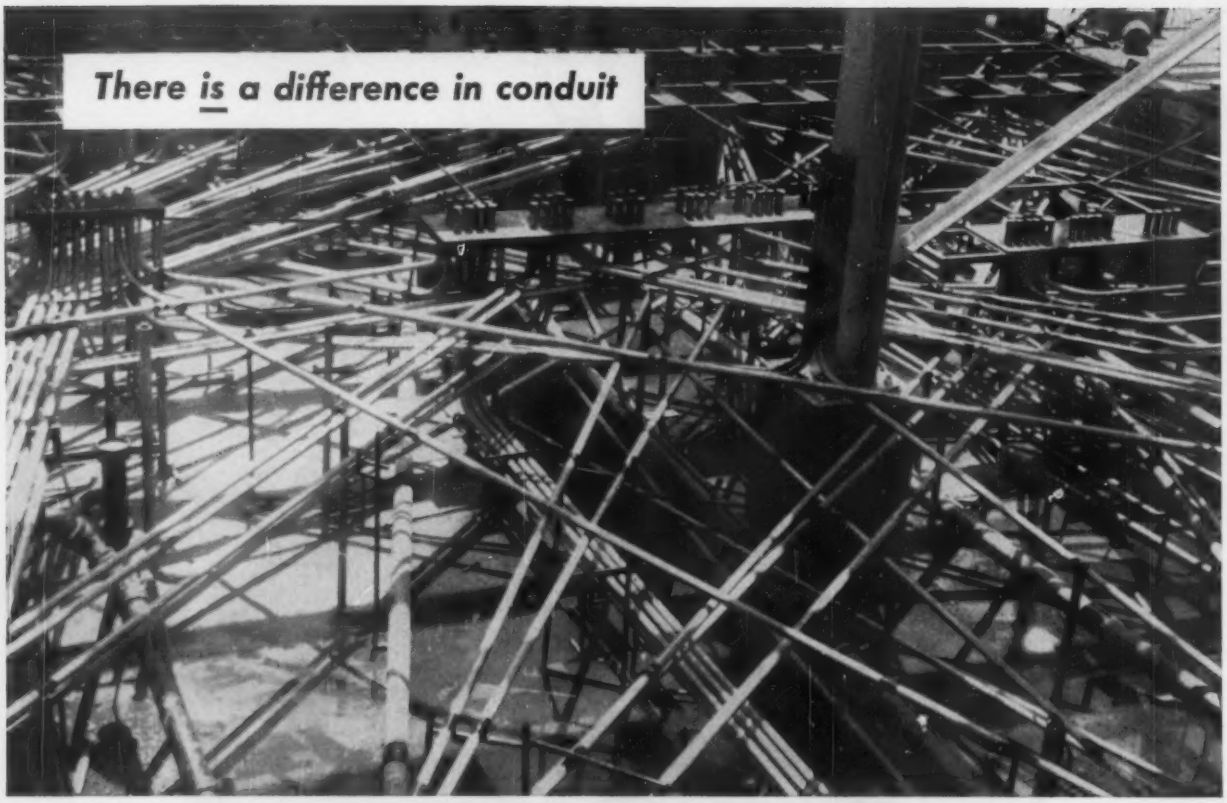
CBM CERTIFIED by ETL

CBM Ballasts are checked by tests regularly, at E.T.L.

And there are other benefits too . . . such as peak light output, long lamp and ballast life, positive starting, dependable service. Because CBM ballasts are made to definite specifications . . . checked and certified by ETL. And of course, they're UL listed. It pays to specify fixtures with CBM ballasts. For the latest dope, ask us to send you CBM News.

CERTIFIED BALLAST MANUFACTURERS, 2118 Keith Building, Cleveland 15, Ohio.

Participation in CBM is open to any manufacturer who wishes to qualify.



1) STRENGTH IS IMPORTANT: Even when installed in a concrete slab, conduit must have the strength to replace structurally the concrete is displaces. Because it is made of steel, G-E WHITE GALVANIZED conduit maintains its strength — will not deteriorate in concrete containing anti-freeze or accelerators . . . can be placed in direct contact with reinforcing rods without fear of electrolytic corrosion.

With all the talk about what type of conduit to use . . . here are the facts on

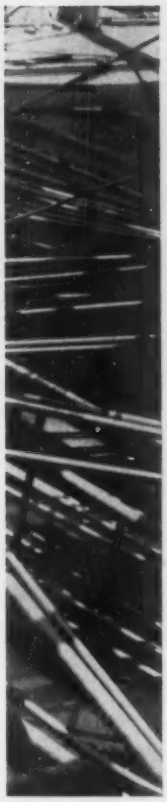
WHY IT PAYS TO USE G-E WHITE

As you know, the first job of conduit is protection. This is one important reason why it pays to use G-E WHITE GALVANIZED steel conduit. In the first place, G-E WHITE GALVANIZED conduit is made of steel . . . and steel is the ideal material to protect electrical conductors from physical harm and guard buildings from damage in case of cable failure. G-E WHITE GALVANIZED steel conduit also gives you top-notch corrosion protection thanks to the special galvanizing process which bonds a uniform coating of hot zinc over every square inch, including the threads. Wire pulling is easier with G-E WHITE GALVANIZED, too, because of the smooth, anti-friction interior coating.

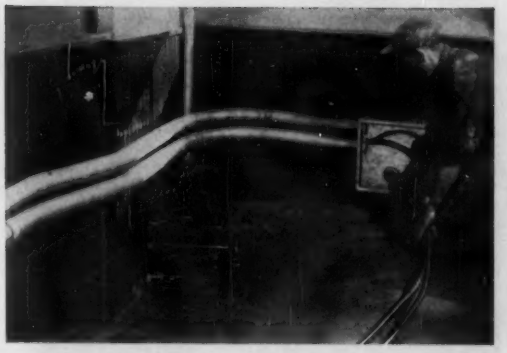
You can use G-E WHITE GALVANIZED steel conduit under conditions that can adversely affect

Progress Is Our Most Important Product

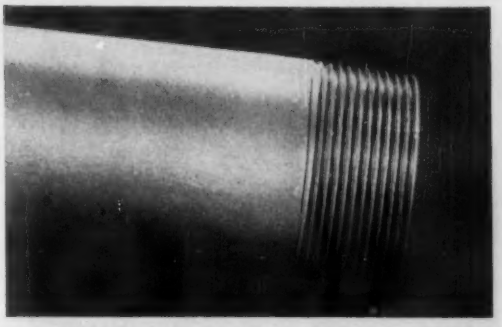
GENERAL ELECTRIC



2) NO SPECIAL HANDLING REQUIRED: Because G-E WHITE GALVANIZED steel conduit resists physical damage, it does not require "kid gloves" handling on the job. You do not have to take special care in cutting, threading or bending as is the case with some conduits made of metal other than steel. G-E WHITE GALVANIZED can be cut with a pipe cutter, threads cleanly without special dies or methods, and bends smoothly without kinking, flattening, or marring.



3) EASY WIRE PULLING: Tough, durable G-E WHITE GALVANIZED steel conduit has a hard, smooth interior surface that resists gouging or hang-ups during fishing and wire pulling. Heavy pulls will not score the inside radius of elbows and bends. Furthermore, the interior of G-E WHITE GALVANIZED conduit is coated evenly with a corrosion-resistant paint containing a special anti-friction agent that results in up to 14% easier wire-pulling.



4) ZINC-PROTECTED THREADS: Threads stay clean and rust-resistant before and after installation because they are hot zinc-coated just like the rest of G-E WHITE GALVANIZED conduit. Because G-E WHITE GALVANIZED conduit is made of steel, the threads do not have to be lubricated to prevent them from "freezing" to the coupling . . . metal is joined direct to metal to give required ground continuity.

GALVANIZED STEEL CONDUIT

some conduits made of metal other than steel. With G-E WHITE GALVANIZED steel conduit you don't have to worry about installations next to dissimilar metals, or in concrete mixes containing additives, or outdoors on absorbent materials. Regardless of the installation conditions, G-E WHITE GALVANIZED does not require any specialized installation methods.

The pictures on these pages illustrate just some of the factors you should consider before making your next conduit purchase. G-E WHITE GALVANIZED is rigid steel conduit at its best — proved in countless installations under the most exacting conditions.

For an informative booklet containing complete product information and useful data tables, send the coupon today.

To: GENERAL ELECTRIC COMPANY
Conduit Products Department
Section CU89-1218
Bridgeport 2, Connecticut

Please send me your bulletin on G-E WHITE GALVANIZED conduit

Name_____

Title_____

Company_____

Address_____

City_____ Zone_____ State_____

Manufacturer of electronic components uses Day-Brite CFI-25 Slimline fixtures for critical seeing tasks.

Automobile manufacturer uses Day-Brite CFI-25 800-MA High-Output Rapid-Start fixtures for parts production.

Office equipment manufacturer uses Day-Brite CFI-30 Power-Groove fixtures for economical and efficient lighting.

WHAT PRICE 100 FOOTCANDLES?

Less than you may think—unless you've heard about Day-Brite's "Operation UP-light" program!

Prices of Day-Brite CFI® (Comfort For Industry) fixtures have been **reduced up to 17.7%.**

25% uplight **cuts operating costs** substantially.

This means **more light** for **less money.**

Plus a big bonus in **eye comfort.**

Get the whole story from your Day-Brite representative, listed in the Yellow Pages of your phone book. Find out why profit-minded plant owners are installing more efficient, more economical Day-Brite CFI equipment.

DAY-BRITE OPERATION UPLIGHT

DECIDEDLY BETTER DAY-BRITE LIGHTING FIXTURES

A-448

Day-Brite Lighting, Inc.
6248 N. Broadway, St. Louis 15, Mo.
530 Martin Ave., Santa Clara, Calif.

NATION'S LARGEST MANUFACTURER OF COMMERCIAL AND INDUSTRIAL LIGHTING EQUIPMENT

Naugatuck PARACRIL OZO

The oil-resistant, ozone-resistant nitrile rubber

Now! lasting **COLORS** in rubber wire jackets

A development of Naugatuck research makes it possible to combine in a vulcanized rubber wire jacket all these properties:

- Excellent resistance to ozone and outdoor "weathering"
- Outstanding heat resistance
- High abrasion resistance
- Excellent oil, grease and chemical resistance
- Fast CV extrusion

...**PLUS PERMANENT BRIGHT COLORS**

In addition to the suggested uses, you will think of dozens of other applications where wire jacketing with all these properties can serve either an aesthetic or utilitarian purpose.

One of Naugatuck's technical representatives will be happy to discuss with any prospective user the formulation of the Paracril® Ozo compound which makes possible this combination of properties... not only in wire jacketing but also in shoe soles, hose jackets, weather stripping and other vulcanized rubber products.

Naugatuck Chemical

Division of United States Rubber Company

Dept. 1234P Elm Street
Naugatuck, Connecticut

US RUBBER

Rubber Chemicals • Synthetic Rubber • Plastics • Agricultural Chemicals • Reclaimed Rubber • Latices • CANADA: Naugatuck Chemicals Division, Dominion Rubber Co., Ltd., Elmira, Ontario • CABLE: Rubexport, N.Y.

59TH YEAR • DECEMBER 1959

ELECTRICAL CONSTRUCTION AND MAINTENANCE

Record Prospects

By every prediction, we should be prepared for a record year in 1960. There is a wealth of new construction already committed. The pressing need for electrical modernization of existing buildings is still unsatisfied. Our new standards for illumination are yet to be applied on any extensive scale. Only brief stretches of our highways are lighted and the overwhelming proportion of our street lighting is long out of date.

In industry we are in a revolutionary phase of control and communication development. In commerce there's a boom in powered office equipment and automatic data processing machinery. Acres of apartments, flats and homes need prompt renovation to acceptable standards or they must be swept away to make room for new residential facilities.

Prospects for electrical business are excellent. Few industries can look forward to such a broad spectrum of urgent market needs. But how much of the market can be served on fully modern technical performance standards? It takes time and much sales effort to gain public acceptance for new and greater values. And in the electrical industry such new values are being created faster than in any other area of construction activity.

It is time to take stock of our resources and how they are going to be employed. Manpower is limited and with an abundance of potential work it should be used effectively and profitably. Bidding contests among contractors are sorely inadequate vehicles for fostering new values and new technical advances. In contrast, there are practically unexplored opportunities for creative, responsible negotiations which can bring the customer the very best values that can be achieved.

Sound sales efforts can open up new areas of opportunity. There are potential customers who are unaware of their urgent needs for new electrical systems and equipment. They don't know what electrical services are available, nor what benefits they could obtain. In this complex industry the initiative must come from the engineers and contractors who have up-to-date knowledge of essential technology and the pace at which it is advancing.

Wm. T. Stuart

Sola indoor constant-wattage mercury-lamp transformers install easily, operate lamps down to 20° below zero

NEW

Now you can insure that your indoor mercury lighting installation will start and keep going even when temperatures slip far below zero. No longer is it necessary to use special, premium-priced indoor transformers or the still more costly weatherproof outdoor type for low temperature indoor installations. Sola's new standard line of indoor constant-wattage mercury lamp transformers keeps H-1, H-25, and H-33 lamps working down to minus 20°F. Two-lamp and single lamp units are both available for these input voltages: 115, 208, 230, 277, 460, and 575. They are ideal for shed, dock and warehouse installations as well as indoor remote mounting to serve outdoor mercury circuits.

These indoor transformers have new, lighter-weight core and coil construction for easier handling. Long leads and twelve knockouts in the new-designed case permit quick and easy connection. The case is liberally perforated for plenty of air circulation around the core and capacitors to give cool, trouble-free operation.

Listed by Underwriters Laboratories, the new indoor transformers incorporate the well-known Sola constant-wattage circuit which gives you these performance benefits:

Low starting current—limits current during warm-up, eliminates need for heavy wiring and time-delay relays, and permits more lamps to operate on the lighting circuit.

Maintained light output — holds lumen output constant within ±1% for line voltage changes as great as ±13%.

Open and short circuit protection — prevents transformer and wiring from overheating.

Insures rated lamp life — reduces premature lamp failure by providing stable operating conditions.

No dropout when line voltage dips — eliminates lamp dropout even when wattage dips of 30% from nominal.

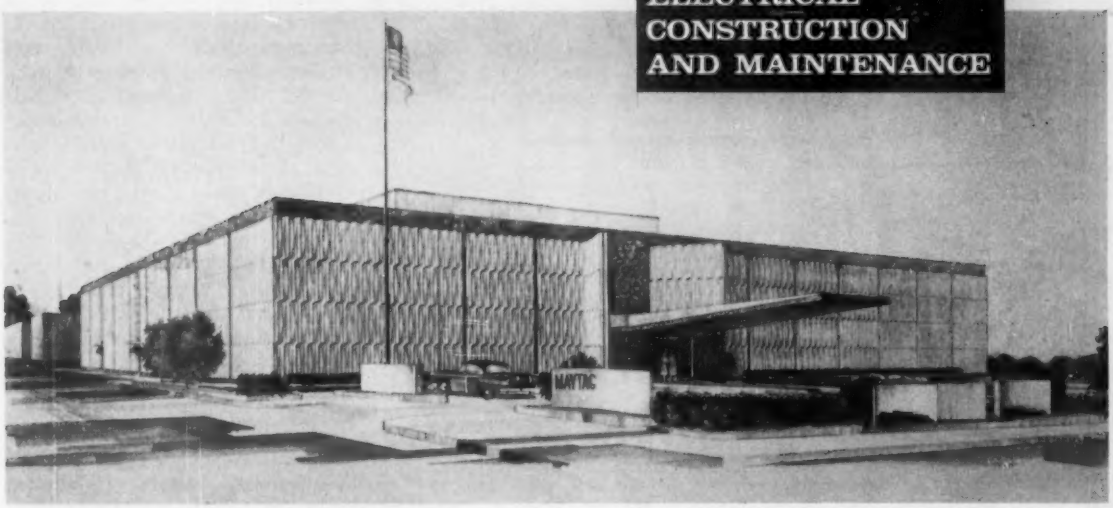
For information, write for Bulletin MVI

SOLA

A DIVISION OF BASIC PRODUCTS CORPORATION

B P C

SOLA ELECTRIC CO., 4633 W. 16th ST., CHICAGO 50



MAYTAG'S NEW HEADQUARTERS is an architectural and electrical combination of a new addition and remodeled existing structure with an attractive modern exterior of essentially windowless design.

At The Maytag Company

Modular Electrical Distribution

provides maximum layout flexibility in new headquarters building. Underfloor duct, lighting and air conditioning permit quick changes at minimum cost.

By August Eckel

ANY desired office layout can be made in The Maytag Company's new headquarters building in Newton, Iowa, without disturbing the lighting, air conditioning, or any electrical raceways. Regardless of office size created by the movable modular partitions, all work areas will have the designed lighting intensities and conditioned air comfort. Access to telephone, signal and receptacle circuits will always be within arm's reach regardless of office equipment arrangement.

This was the goal sought by Maytag management when they decided to more than triple existing office facilities. It was attained by careful coordinated planning by Maytag's construction engineering department and Brooks-Borg, project architects and engineers in Des Moines. The decision to design and install a modular electrical distribution system to match the basic structural module of the building has provided an unusual degree of electrical flexibility to meet present and future requirements.

The new headquarters is a composite 215- by 208-ft building consisting of a completely remodeled existing office structure integrated with a new addition including a basement, two floors and penthouse. The basement contains engineering and product testing laboratories and a completely equipped meeting room with stage. In the penthouse are the unit substations, air conditioning and elevator equipment. The entire building is faced with sculptured, pre-cast concrete panels with buff-colored exposed granite chips on the surface. These are sectionalized by narrow vertical tile strips with slot windows—the only windows in the building.

To secure the desired modular flexibility throughout the office floors, columns of the new addition are spaced to match those in the existing structure. Bay dimensions are 24 by 19 ft 3 in., the odd dimensions being the carryover from the old building. This set the basic office module as 12 ft by 9 ft 7½ in., or about 9 by 12 ft for the smallest office, and established the nucleus of electrical distribution design.

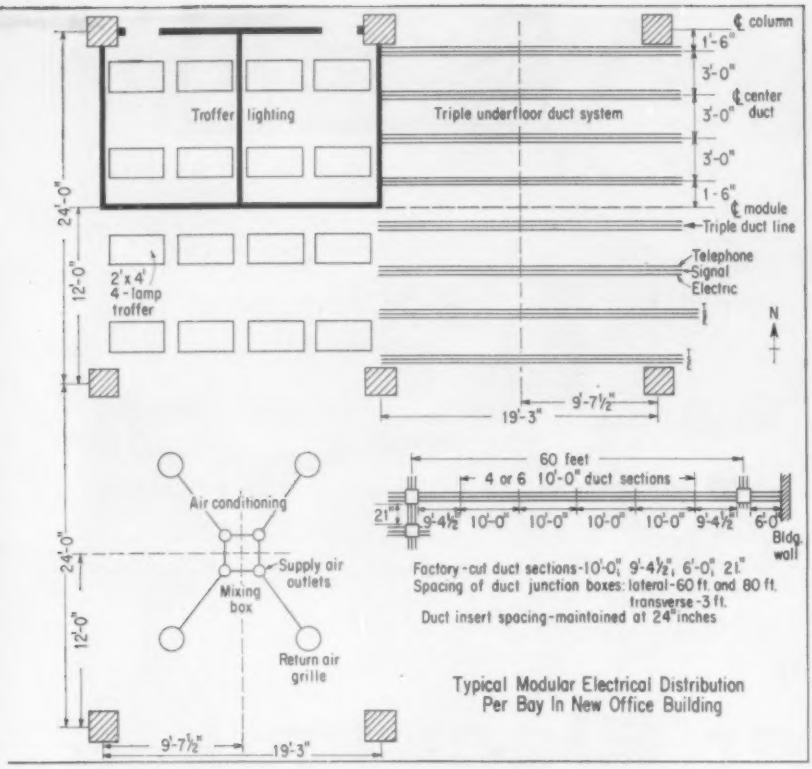


FIG. 1—Composite plan of typical office bays showing modular approach to lighting, underfloor electrical distribution and air conditioning. Note factory-cut duct lengths (lower right) to meet dimensional requirements and speed duct installation.

Since management wanted every square foot of floor space "usable," underfloor electrical distribution flexibility entered the picture at the earliest stages of building design. The architects considered some 11 different structural systems, including cellular steel floor, before deciding that pan joist concrete construction with underfloor duct was —for that area—the most economical method of obtaining the desired structural and electrical features.

Out of this research and study came an interesting discovery. It was economically feasible, on this project, to reduce spacing between parallel runs of multiple underfloor duct to 3 ft. This approached the electrical flexibility of cellular steel floor at lower cost. Previously, a 6- to 8-ft spacing was considered the minimum by the architects.

Several underfloor systems were investigated. The selected steel duct system was chosen primarily for its design and installation features. These included: 1) large area junction boxes with removable interior partitions to facilitate future circuiting; 2) square, adjustable access covers to match building lines and simplify floor tile cut-outs; 3) knockouts in bottom of junction boxes for present and future conduit feeders in hung ceiling below; and 4) sturdy, adjustable duct supports which form a coupling for duct sections.

The underfloor duct grid on the first and second floors consists of parallel lines of triple-duct installed on 3-ft centers. These runs go from the west to the east walls of the building with in-line junction boxes on approximately 60-ft centers (or multiples of 10 ft). Triple-duct transverse ties connect the duct lines at the junction boxes to complete the grid. The center duct in each run is designated signal (or spare). The north duct is for telephone circuits; the south for 110-

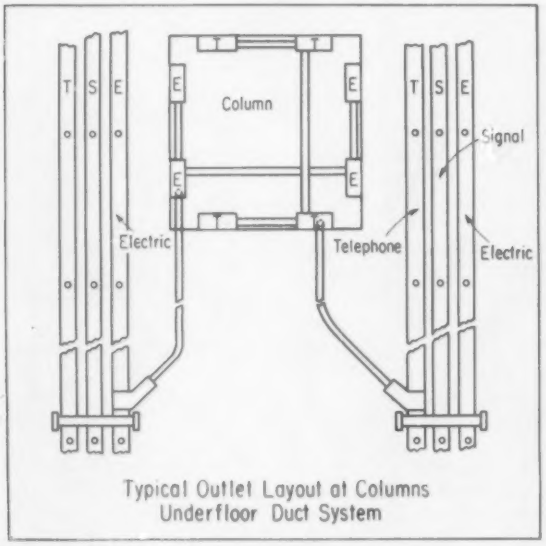
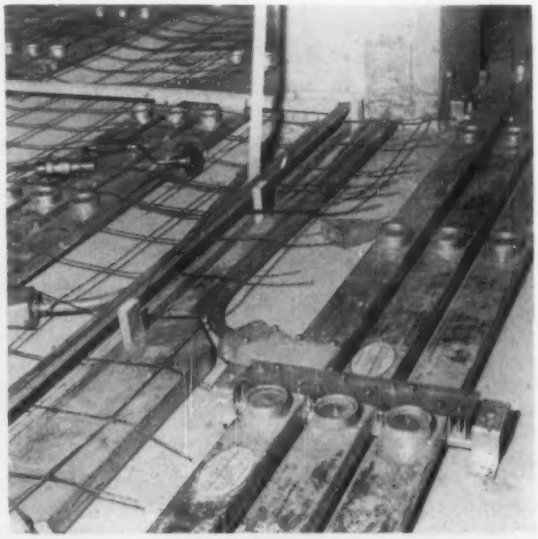
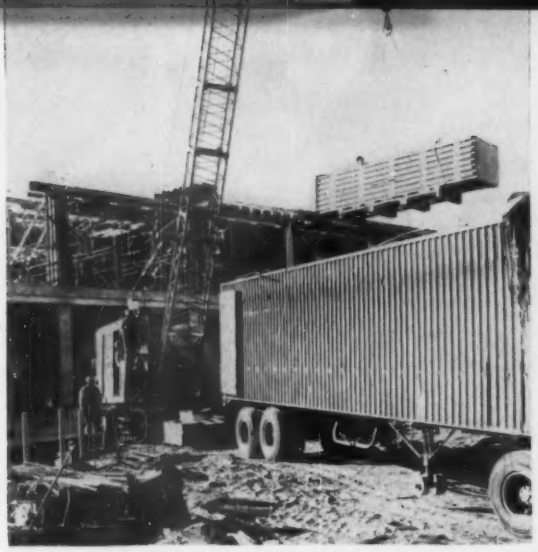


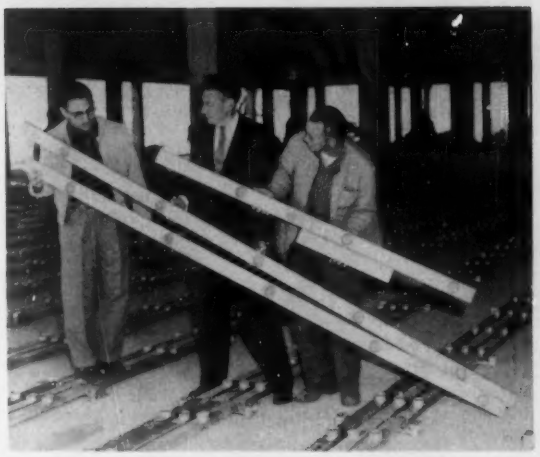
FIG 2—Column outlets supplement underfloor system. Duct-fed layout provides one telephone and one 110-volt outlet near column corners.



CONDUIT TAPS from duct lines feed additional telephone and 110-volt outlets in office columns. Duct inserts have standard 2-in. conduit thread.



CRANE UNLOADS 5-ton pallets of underfloor duct from open trailer at job site; spots them at convenient floor dispersal points; reduces handling time to absolute minimum.



DUCT WAS PRECUT at factory to meet layout dimensional requirements. Checking shipped sections at job are: (L to R) Mel Kuel, Keating Company electrical engineers; J. W. Hudson, manager, Gateway Duct Div., Gateway Engineering Co.; and M. L. Hayes, Keating's project superintendent.

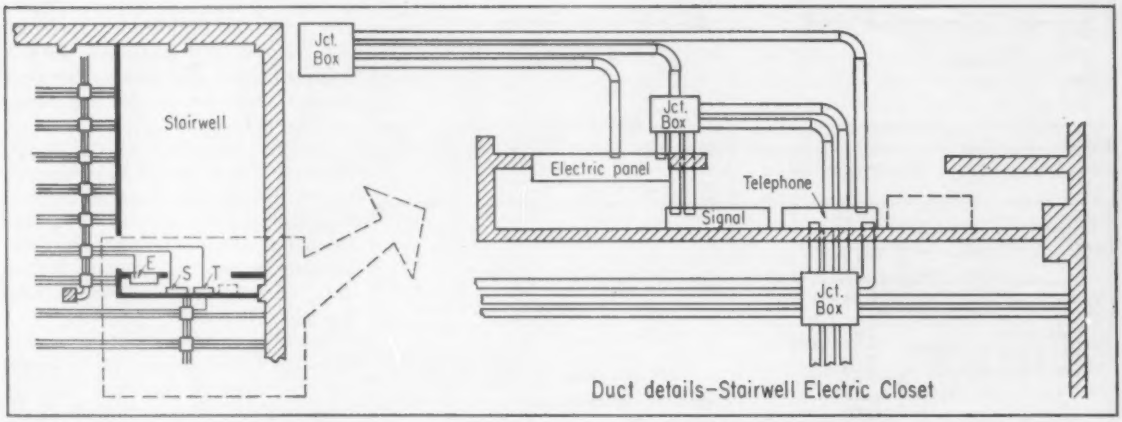


FIG. 3—Electric closets at stairwells contain panels for telephone, signal and 110-volt underfloor distribution; also lighting system.

volt circuits. Standard 24-in. insert spacing is maintained throughout the entire duct installation. This provides access to the three systems on a 36-in. by 24-in. pattern over the entire floor.

In addition, each building column has eight flush, duct-fed outlets (two per side) near the column corners. Thus, even the minimum 9- by 12-ft office module has at least one telephone and one 110-volt column outlet plus 12 underfloor ducts (four per system) with circuit access inserts on 24-in. centers.

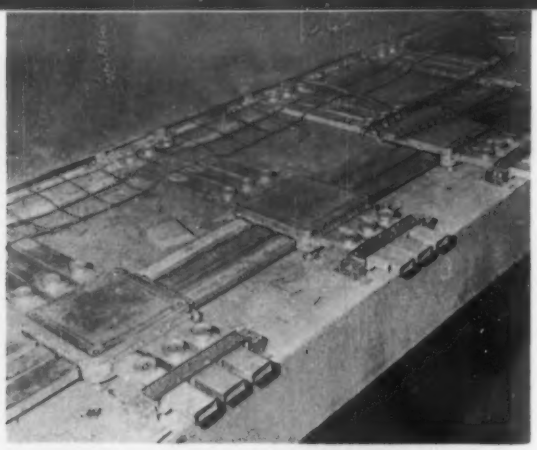
Duct lines are fed by panels in four electric closets: two in the service core between the remodeled existing structure and the new addition; and two in the north stairwells of the new building. Duct ends extend beyond the floor slabs at the stairwell shafts for future interconnection between floors. When desired, simple addition of duct ells and vertical sections will tie the two floors together for additional distribution flexibility.

The larger addition was completed first so personnel could be moved before remodeling of the existing building was started. To permit extension of the underfloor system into the old building, the level of the rough slab in the new addition matched the finish floor level of the old building. The final 3-in. pour covering the duct in both sections provided a smooth surface over the entire area for the selected floor covering.

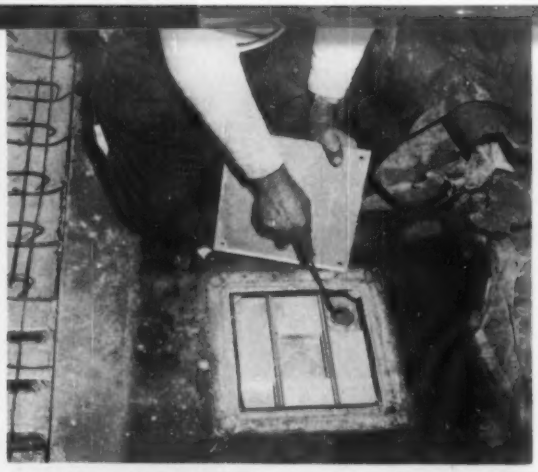
The Keating Company, Des Moines, project electrical contractor, used concrete nails to fasten duct supports and junction boxes to the floor slab in both sections; leveled all lines with a transit. Supports were rigid enough for the general contractor to wire his screed boards to the duct lines and, after a final transit check, make the final pour.

Modular Lighting Layout

With only a limited number of narrow slit windows in the building exterior, the new headquarters was considered windowless for lighting design purposes. Since interior lighting would have to do the complete job, it was imperative that the quantity and quality of illumination be such that intensities on the working plane would remain essentially the same regardless of



AT STAIRWELLS duct ends project just beyond slab into open shaft; permit future addition of vertical sections to connect first and second floor duct systems for greater distribution flexibility.



BOTTOM ACCESS to floor duct junction boxes is convenient design feature. At least twenty 1½-in. conduit homeruns for future telephone system expansion enter boxes from suspended ceiling below.

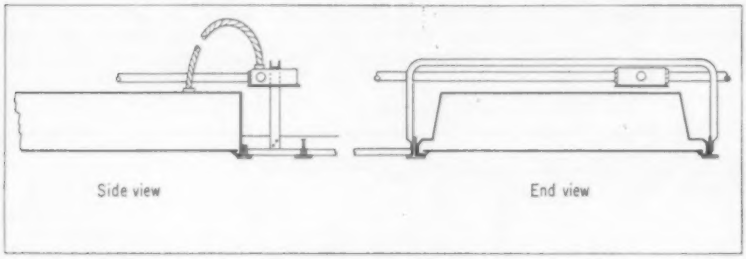


FIG. 4—Side and end views of fluorescent fixture show circuit connection and flush mounting of troffers in suspended ceiling.

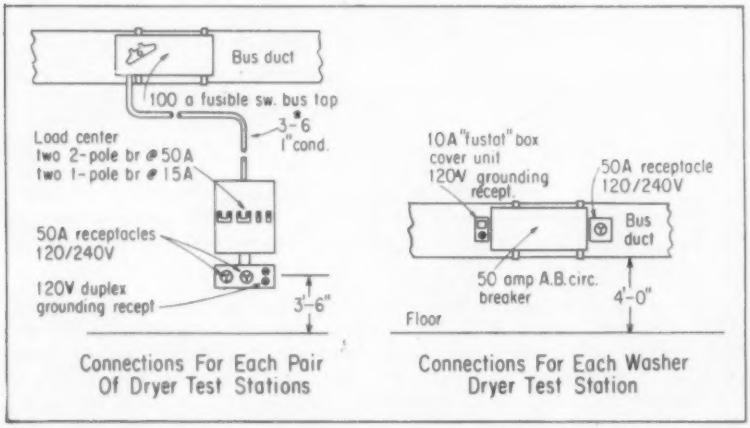


FIG. 6—Test stations in engineering and product laboratories are fed by bus duct runs mounted at convenient plug-in height.

future rearrangement of partitions.

Again, the basic 9-ft 7½ in. by 12-ft module was the bench-mark for the overall system design. Layout for this minimum area set the lighting design pattern for both of the office floors. Several typical office mockups were made to study luminaire types and arrangement. Final design centered on four fixtures per basic module. Spacing was established by dividing a typical 24-ft by 19-ft 3 in. bay into 16 equal parts and centering a fixture in each (Fig. 1). With this pattern maintained throughout the floors, the number of fixtures per office area became the same multiple of the basic module as the office size. For example: a full-bay area (four modules) would have 16 fixtures; a half-bay area (two modules), eight fixtures; a quarter-bay area (one module), four fixtures. Spacing between fixtures permits floor-to-ceiling partitions, if desired, without disturbing installed lighting units.

Each luminaire is a 2- by 4-ft, 4-lamp, flush fluorescent troffer with a Corning "71" glass enclosure. Lens construction consists of 5-sided prisms lightly tinted to eliminate any gray and blue color overtones. All fixtures are equipped with a 2-lamp ballast and sockets for four lamps. Only two lamps are being used at present.

Design intensity with two lamps per fixture is in the 75-80 footcandle range. Simple addition of another ballast and more lamps can up this intensity correspondingly if more lighting is required at some future date. Circuiting is designed to take the added capacity.

Remote area control of office lighting is by means of 110-volt, 3-pole, solenoid-operated contactors, each of which controls three lighting circuits. Contactors, in turn, are operated by gangs of switches on the floor stairwells.

The same modular approach was applied to the air conditioning outlets throughout the office floors. Each office bay has four air supply and air return grilles. They are ceiling installed in such manner that division of a bay into four basic office modules would leave one supply and one return outlet for each module.

Close cooperation between the electrical contractor, general contractor, architects and engineers and equipment suppliers always facilitates construction progress. On this job it provided a substantial saving in underfloor duct and lighting fixture installation time. Most of it was due to pre-arranged equipment shipment and job-site material handling techniques.

SUPPORTS ARE ANCHORED to floor slab with concrete nails. Addition of spacers and top bridge provides rigid duct coupling; cuts installation time.

SCREED BOARDS and reinforcing grid are wired to leveled duct lines prior to final pour. Rigid support design and anchoring permitted this time saving procedure.

SPARE CONDUIT homerun for telephone system enters underfloor duct junction box through recess of pan joist concrete floor construction. Hole is drilled down from knockout in bottom of box.

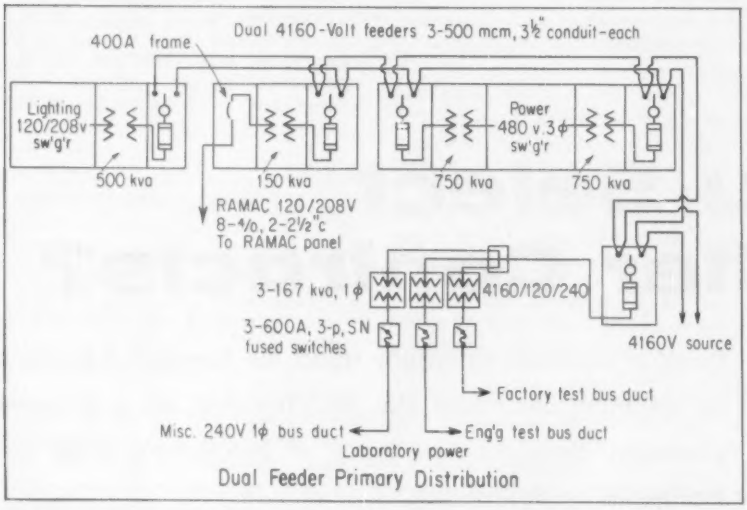


FIG. 5—Dual primary feeders provide building electrical service; terminate at fused, interrupter-type selector switches at substation transformers; insure against complete loss of power due to an outage.

Factory Precut Duct—On the basis of the duct layout shown on the plans, the electrical contractor convinced the duct manufacturers that it would be mutually advantageous to all concerned (owner, manufacturer, contractor) to have the duct factory-cut and shipped in four prescribed lengths: standard 10-ft sections; 9 ft 4½-in. sections; 6-ft sections; and 21-in. sections for crossties (Fig. 1). This minimized on-the-job cutting to meet dimensional requirements. In fact, out of some 40,000 ft of duct installed on the first floor, less than 20 ft was waste.

Palleted Shipment—At Keating's suggestion, the duct was shipped without cartons, in 5-ton palleted bundles in an open-top semi-trailer. A construction crane at the job unloaded the duct and spotted the bundles at convenient dispersal points on both floors.

Disassembled Supports—The top bridges and mounting screws for all duct supports were shipped separately. This eliminated removing the bridges when installing the duct lines and minimized lost time looking for lost mounting screws.

During installation, the underfloor duct system went together like the pieces of a jig-saw puzzle. Coupled with the above material handling features were the time economy of concrete-nail mounting, combination duct support and couplers, bottom feed access to junction boxes, and various design features of the duct accessories. Contractor estimates indicate an overall saving of approximately 50% in duct system man-hours compared to previous experiences.

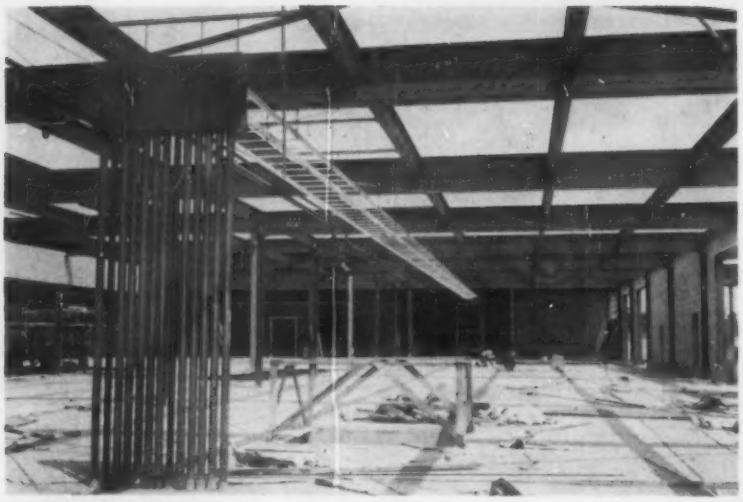
Similar methods were applied to handling approximately 3,000 lighting fixtures. Each fixture was shipped in a carton without the glass enclosure. Framed lenses were shipped six to a carton. Successive installation crews on rolling-scaffolds mounted and connected the troffer "tubs"; cleaned the "tubs" and inserted the lamps; added the glass diffusing lens frames. This procedure reduced handling time and minimized breakage.

To guard against complete outage due to service failure, dual 4160-volt, 3-phase feeders serve three unit substations in the penthouse and a bank of transformers for the basement test laboratories. Each feeder consists of three 500MCM conductors in 3½-in. conduit.

A double-ended unit substation with two 750 kva, liquid-filled, 3-phase transformers provides 480-volt, 3-phase power for two 300-ton air conditioning units, two elevators, miscellaneous 480-volt power panels and service to a research building across the street.

The lighting substation has a 500 kva, liquid filled, transformer and provides 120/208-volt, 3-phase, 4-wire power to all lighting panels in the building. Lighting panels have from 80 to 120 breakers and remote control contactor panels house from 20 to 30 3-pole relays for area control of office lighting.

Secondary power for basement laboratory test facilities is secured from a bank of three 167-kva, single-phase, 120/240-volt, platform mounted, dry type transformers.



NEW CONSTRUCTION with its uncluttered areas permits most efficient use of manpower; presents fewer unforeseen installation problems.

ALTERATION WORK involves more "unknowns," more field engineering and supervision, more installation manhours per given assignment.

Can You Select The Better Contracts?

PART I

Types of contracts materially affect the amount of business an electrical contractor can do. This first of a two-part discussion compares two types of installations from the standpoint of desirability.

By Ray Ashley, *Research and Consulting Engineer, Oak Park, Ill.*

DO YOU know that an electrical contractor's volume of work can vary as much as 200% depending on the types of contracts procured? Or that a job running twice as long as it should costs 10% more than it would for normal duration? Are you aware that Installation-Only contracts (material by owner—installed by contractor) generally are not as desirable as complete installation contracts? Questions like these can pinpoint vast differences in the desirability of contracts of the same dollar volume.

Space limitations preclude classifying the many types of work in this discussion. For purposes of comparison, and to illustrate how much the desirability of contracts can vary, an alteration project and an industrial feeder installation will be studied.

Alteration Work

As a rule, small and medium size alteration jobs are not considered the "desirable" type. For the amount of money involved, the estimating cost is high, supervision is costly, duration is prolonged and investment turnover is slow. The better mechanics and equipment are tied up longer than normally.

Ordinarily, we emphasize the high labor costs for special projects without considering the high operating costs. Fig. 1 shows a comparison of operating costs likely to be experienced on new and alteration projects of similar type and volume. Both the material and labor costs for the latter run much higher.

One phase of alteration work requiring special attention is that of potential hazards. While most of these are well known to seasoned estimators and experienced contractors, three specific ones are often overlooked by beginners. They are:

1. Progress of other trades
2. Occupied spaces
3. Concealed work

Other Trades—Progress of other trades is important. Electrical work may have to be done piecemeal because the other trades are on and off the job. Or, the electrical con-

tractor may have only a small amount of work, but have to keep men on the job to work with other trades.

In the case of a suspended ceiling, the electrical contractor has to work along with the lather. On large alteration projects, this is no different than on a new installation. For small alterations, lathing progress may be very irregular.

Occupied Spaces—The hazards of occupied spaces vary according to the type of installation. There are offices, factories, warehouses, hospitals and many other types of installations, each of which has its own problems. In a warehouse, it is a case of moving or working around stock. In an office, furniture must be moved and protected, noises limited and working spaces kept clear and clean at all times. In a factory, men have to work over and around machinery. These are just a few examples. Much could be said on this subject, but discussion must be limited.

In general, one may expect to find work in occupied spaces running somewhat above normal. The following is a good indication of cost increase:

Offices 30%-50%
Factories, over machinery
30%-60%
Factories, over benches
25%-35%

Concealed Hazards—Contractors, estimators and mechanics soon learn the seriousness of hazards on jobs where existing walls have to be removed. Specifications for such work usually hold the contractor responsible for all concealed work. He must remove and replace all conduits and keep the system in continuous operation.

The fire job is one type of restoration work that the novice must approach with caution. One is inclined to assume that the damage is limited to the burned out section and that the damaged wire can be easily removed because it is loose at that point (insulation is burned off). There may be other sections some distance from the actual fire where enough heat has traversed conduits to vulcanize insulation and "freeze" conductors in. The pipes get red hot and when the water is poured on some of the heat shifts. We have all had the experience of inserting the heated end of a rod in water and having the heat rush by conduction to the end we are holding in our hand.

Industrial Projects

Contractors seek all types of industrial work where materials are to be included. Installations of large power feeders can be especially desirable. On such projects, the contractor has complete control of his work and is not dependent on other trades. The turnover is quick. There are no concealed hazards. Mechanics can be used to the best advantage. The Material/Labor ratio is good.

Quick Turnover—The quick turnover on a job means much more to the contractor than just the turnover of money invested. It means that good foremen and tools are not tied up as long as they would be on many other types of contract of the same volume. A contractor's capacity is limited by the number of good foremen and superintendents he has available.

In general, a contractor's whole organization functions better on an industrial feeder job than on alteration work. One may be able to double his volume if work is of the select type instead of hit and miss contracts.

Mechanics Needed—The manpower problem is not usually as serious for industrial work as for commercial installations. Foremen can direct work more easily and medium rate mechanics can be absorbed.

The interest a mechanic takes in his work is generally highest on industrial contracts. He follows his job all the way through and sees the completed product.

On multi-story concrete buildings, the mechanic installs conduit and boxes which are soon covered with concrete. He stubs up conduit and goes on leaving it to be extended at a later date. When the job is trimmed, he may be in a section of the building entirely new to him. Under such conditions he does not have the incentive that he had when carrying an entire piece of work to completion.

Future Work—The possibility of one job in an industrial plant leading to another is good. Most industrials are constantly making additions and changing departments around.

Many contractors have found that, during dull periods, more work was coming from their regular industrial customers than from all other sources. At such times, a small amount of work does more than provide some income. It is a great tonic for a sinking morale.

Contract Merits

Although industrial work has been used as an example, there are many other types that have also been found remunerative and interesting. Much money has been made on office and commercial buildings. Schools, hospitals, theaters and many other types of buildings have provided remunerative work for contractors who understood them.

Competition is greater for industrial work than for the run-of-the-mill jobs. It is easier to figure, simpler to expedite and offers less hazards. Hospitals, office buildings, power plants and many other types of work, at best, offer an element of uncertainty and contractors hesitate to figure them.

FIG. 1—A COMPARISON OF OPERATING COSTS NEW VS. ALTERATION WORK

ITEM	MATERIAL		LABOR	
	New	Alter.	New	Alter.
	%	%	%	%
Estimating and engineering	2.00	3.00	3.00	6.00
Supervision	.....	.....	2.50	5.00
Blue printing and job stationery	.....	.....	.10	.15
Tools—Consumed and depreciation	.....	.....	3.00	3.50
Cartage and special delivery	.20	.50	.20	.30
Procurement	1.50	2.00	.....	.....
Travel exp.—Office to job	.....	.....	.10	.30
Job office and miscl	.10	.20	.25	.75
General overhead and admin. exp	8.00	10.00	20.00	30.00
Totals	11.80	15.70	29.15	46.00

NOTE—Values are shown as a percentage of base costs of material and labor.

SIDEWALKS outside John T. Ryan Memorial Laboratory in Pittsburgh are kept free of snow and ice by 57.6 kw of flexible heating cable.

WIRE MESH, with heating cable wired in place, is carefully laid over sub-layer of concrete. Finish layer is then poured over wire.

Heating Cable:

Winter Workhorse

Flexible electric heating cable is serving industry in an ever-increasing variety of time- and money-saving applications.

By W. S. Eyth, *Edwin L. Wiegand Co., Pittsburgh, Pa.*

EXAMPLES described here of flexible electric heating cable in use demonstrate its value and versatility in solving heating problems.

The cable used in these installations consists of a high-quality resistance wire covered by polyvinyl or silicone insulation, with a water-tight molded connection between the heated cable and the cold lead wire. Maximum operating temperatures are 167F for the polyvinyl, 300F for the silicone.

Advantages over more rugged high-temperature, refractory-insulated metal sheath heaters include its small diameter (approximately ¼ in.), permitting it to occupy a minimum of space, and its flexibility, making it possible to form the cable into any desired shape. With proper installation, the cable is completely moisture-resistant.

No longer merely a "soil heating cable," as it has been designated in past years, this relatively new aid to industrial production now serves a variety of uses ranging from space heating to snow removal, pipe heating and the control of fluid viscosity, volatility and chemical action.

The 1440-sq ft cable-heated sidewalk shown in an accompanying photo provides a winter heating load of 57.6 kw at 40 watts per sq ft, a load which just matches the electrical system capacity previously provided in the building to handle summer air conditioning.

The cable was stapled to 5- by 20-ft pieces of 6- by 6-in. No. 6 commercial mesh to hold it in position during pouring of the concrete. The mesh was put into place after the pouring of the first sub-layer of concrete; the final 1-in. finish coat was then applied over the cable and wire mesh. The cold lead sections of the heating cable were brought out through conduit and terminated in junction boxes at the edge of the sidewalk.

The cable is energized by the watchman as soon as snow begins to fall. Operational costs are reasonable. With a rate of 1.5 cents per kwhr, this installation would cost about 87 cents per hour to operate, while a workman shoveling snow costs about $1.75 per hr—and, since the workman can be in only one spot at a time, the sidewalk is never completely free of snow.

Because heating cable is installed uniformly over the surface area, there is a very low temperature

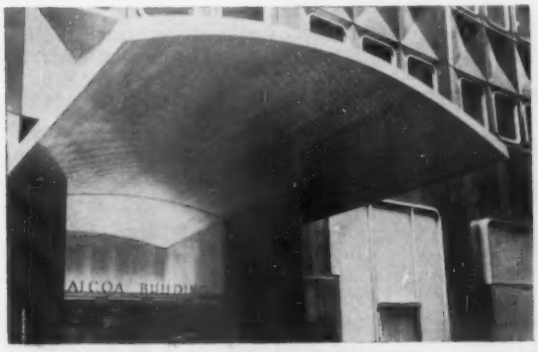
Degree of Protection for Water Pipes*

Type of Installation	⅜-in. Pipe		½-in. Pipe		¾-in. Pipe	
	Temp. protected to (Degrees F)	Length of cable per ft of pipe	Temp. protected to (Degrees F)	Length of cable per ft of pipe	Temp. protected to (Degrees F)	Length of cable per ft of pipe
80- or 160-ft loop, 2 wires straight along pipe	−16	2 ft	−10	2 ft	−5	2 ft
Same as above, but spiraled. (16 turns per ft)	−23	3 ft	−18	3 ft 8 in.	−12	4 ft 2½ in

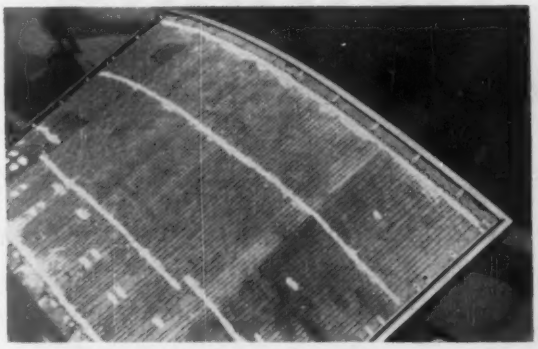
* Assumes no wind and no insulation.

LEAD WIRES are run out to junction box through short length of conduit while laborer distributes finish layer of concrete.

JUNCTION BOXES are located outside concrete and filled with moisture proofing compound after splicing of heating cable lead to circuit home run.



CANOPY of Alcoa Building in Pittsburgh (above) was fitted with 8 kw of heating cable over its 357-sq ft area. The cable,



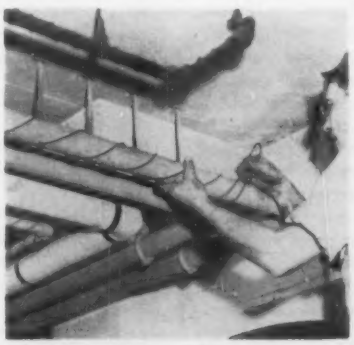
held in place by resurfacing material (above) was later covered with aluminum sheeting.

gradient in the concrete itself, decreasing the hazards of cracking. The uniform distribution also insures even melting.

A second example of snow removal is the reinforced concrete cantilevered canopy over the front entrance of Pittsburgh's new Alcoa Building, kept free of snow by 8 kw of heating cable uniformly spaced over its 17- by 21-ft area.

The rapid melting of snow and ice prevents an accumulation which would otherwise represent a significant load on the structure and present a hazard of falling snow or ice to pedestrians using the sidewalk below.

An accompanying photo shows sprinkler pipes protected from freezing by heating cable. In remote areas of warehouses and storage spaces, especially near windows and doors, freezing is a constant danger. The table included here gives the degree of protection in degrees Fahrenheit for the two common installation methods—in straight runs along the pipe, or wrapped around the pipe and held in place with friction or plastic tape. Under extreme temperature conditions, it is desirable to insulate the pipe. This may be accomplished by using oversize pipe insulation (to provide a minimum air space of $\frac{1}{2}$ in. between the heating cable and the insulation) held in place by means of wire spanners. A thermostat should always be used for automatic protection when pipe is insulated. The actuating bulb is located in the air space between the heating cable and the insulation, which will automatically energize the cable when the air temperature becomes low enough to cause freezing.



SPRINKLER PIPES are prevented from freezing in this installation by wrapping heating cable around the pipes. Each length of cable is installed as a loop, permitting both end leads to terminate at the same spot and cancelling inductive effects between adjacent turns.

Chemical process systems and fuel oil systems also normally require heat. In the case of chemical systems, the heaters are required to offset heat losses which lower the viscosity and reduce flow of the material in the piping which could otherwise cause damage and lost production time. Since the material is normally warm when it enters the pipe or valve, it is merely necessary to apply the heat to offset the losses that occur from the pipe.

In Bunker C fuel oil systems, the fuel oil is heated at the storage tank by means of a packaged circulation heater (heat exchanger) and then pumped to the burner proper. The temperature of the oil in the piping system between the storage tank and the burner must be maintained at 150 F in order to insure efficient ignition and combustion.

The amount of flexible heating cable that is required on this type of application may be easily calculated from standard heat loss curves which give the amount of heat that is lost from a metal surface at various operating temperatures.

KLM building in New York City reveals . . . .

Details in Commercial Rewiring

A close look at electrical modernization in a 13-floor office building which was rebuilt from a stripped-down shell. Electrical design was done by Ebner Associates, consulting engineers, New York City, in close cooperation with Davidson Electric Company, Inc., electrical contractors, Brooklyn, N. Y. Architects were Antonin Raymond and L. L. Rado.

By J. F. McPartland

ELECTRICAL modernization of the most extensive type is well represented in a New York City office building. Known as the KLM building, it now houses the American executive offices of KLM Royal Dutch Airlines. This 13-story building was formerly occupied by a specialty store. Electrically, conversion from the old to the modernized almost constitutes new construction. The overall job presents an interesting study in the details of such modernization.

The first step in overall modernization reduced the building to a mere shell containing over 138,000 sq ft of floor space in 13 floors. All interior partitions were removed, but the stairwells and pipeshafts were left intact. Existing ac and dc electrical systems were removed. Removal covered: all existing wires and cables, all exposed surface raceways, all surface-mounted electrical equipment and general lighting fixtures. The only equipment left in place included: all concealed in-slab conduits, riser conduits in electric closets and pipe shafts, most of the exit light fixtures and the porcelain lampholders in pipe

NOTES FROM THE JOB SPECS

Concealed Conduit: Where homeruns or other conduit in floor slab or fill are cut by installation of new shafts or mechanical equipment, Contractor shall remove, as far as possible, all conduit and boxes associated with the cut conduits and now rendered useless. At the lighting panels, cut these conduits back to the floor or ceiling slab and block underfloor conduits with waterproof cement. At their floor and wall outlets, remove the outlet boxes and stop up the conduit ends, so that these may be cemented or plastered over. These instructions apply to telephone as well as electrical conduits.

Continuity and Grounding: All conduit shall be fastened to each adjacent section and to all boxes, fittings and equipment with firm, clean, metallic contact so that the entire conduit system is well and continuously grounded.

Avoidance of Moisture: Install conduits to avoid traps conducive to collection of moisture. Insert sealing fittings where conduit leaves building interior or enters refrigerated or hazardous areas. Underground conduits shall slope toward manholes and away from buildings.

Uniformity: Only one type of protective coating may be used for steel conduit. That is, Contractor shall use either sherardized, hot-dipped or electro-galvanized conduit. No intermixing will be permitted. Aluminum conduit may be used for either all sizes or for the larger sizes. Above a selected size must be of aluminum and the remainder must be of steel. Electrical metallic tubing may be either entirely of steel or entirely of aluminum.

Color Coding: Consistent phase identification shall be maintained throughout the 120/208-v and 265/460-v electrical power systems with wires color coded as follows:

120/208-v System "A" Phase, black; "B" Phase, red; "C" Phase, blue

265/460-v System "A" Phase, brown; "B" Phase, yellow; "C" phase, orange

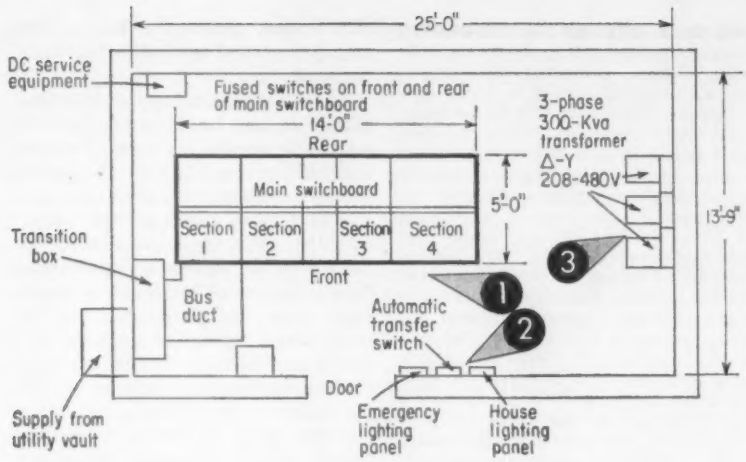
Neutral Wire: White Ground Wire: Green

Minimum Wire Sizes: No. 12 for lighting and convenience outlets; No. 14 for motor and motor control circuits. Use No. 10 wire for lighting circuits where distance from lighting panel to first outlet exceeds 60 ft for 120/208-v system and 120 ft for 265/460-v system.

Standard Rigid Conduit: Aluminum alloy or high grade, mild steel.

Electrical Metallic Tubing: Aluminum or steel.

Connecting and Splicing Devices: For sizes No. 8 and larger use bolted or compression type connectors, taps and splices. For No. 10 wires and smaller, terminals shall be applied either by wedge pressure devices or by plastic compression. Connectors for two or more wires shall be the plastic type.



BASIC LAYOUT in basement electrical room is the heart of the overall distribution system. Circled numbers correspond to numbers of accompanying photos, with the angles of camera-shooting indicated.

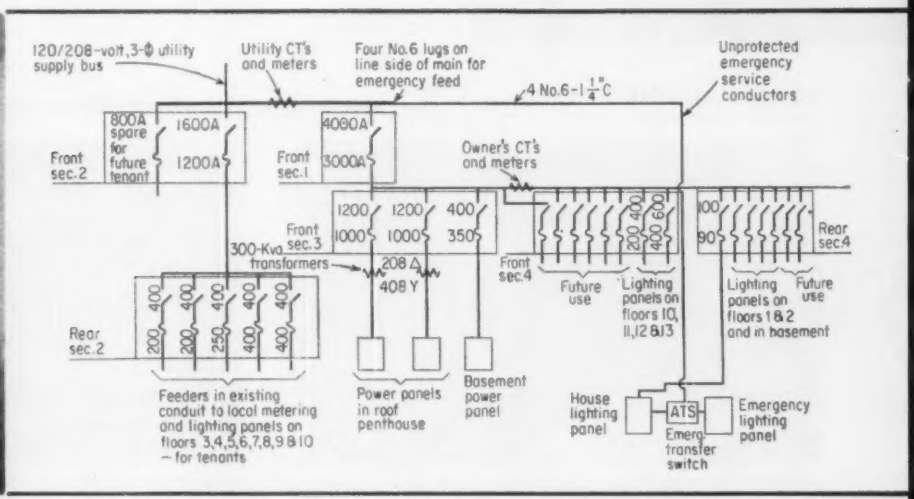
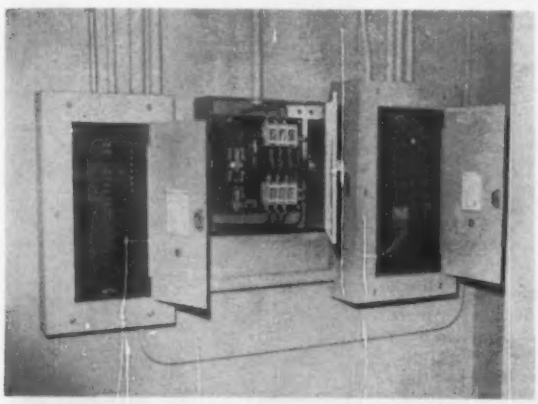


PHOTO 1—MAIN SWITCHBOARD is a back-to-back, free-standing assembly of fused switches. The internal bussing and metering arrangements are subdivided as shown to meet the requirements of the building. KLM occupies part of the building, and the rest is being leased to tenants. Layout of feeders provides for central and local metering now with ready convertibility to a future condition in which KLM will occupy the entire building with only central metering. Switchboard bussing is copper of 98% conductivity sized for 800 amps per square inch of cross section. High-capacity, current-limiting fuses are used in the main switches to meet the interrupting duty at that point. Silver-sand fuses are used for feeders larger than 600 amps. Smaller fuses are of the dual-element type. Selective coordination is provided in the fuses.



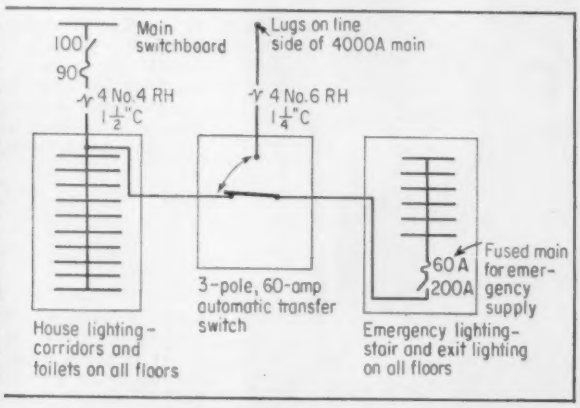


PHOTO 2—EMERGENCY SUPPLY is furnished by a tap from the line side of the main switch. Two panelboards are normally fed from the single 100-amp switch, with the emergency panel fed through the transfer switch. On failure of the normal supply from the main switchboard, the ATS automatically connects the emergency panel to the No. 6 supply.

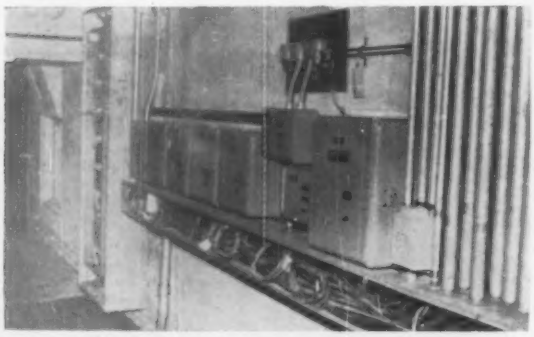
PHOTO 3—STEP-UP TRANSFORMERS are used to raise voltage level from 208-volts, 3-phase, 3-wire to 480-volts, 3-phase, 3-wire for feeders to heavy concentration of motor loads in roof refrigeration room. This design offered substantial economy in secondary conductors and motor controllers, permitted use of existing conduit risers to carry the total kva load, reduced the problem of voltage drop and provided efficient operation of the motorized equipment. The savings represented therein far offset the cost of the transformers. Each of the three transformers (one is a spare) is 300-kva, dry type, with class B insulation. The secondary neutral point is brought out to a grounding stud welded to the enclosure and grounded through the conduit to the switchboard ground bus. Spare unit is at left, on skids. Box shown on wall contains primary supply to transformers and outgoing feeders to roof power panels.

shafts and stairwells. From this stage, electrical rehabilitation went forward.

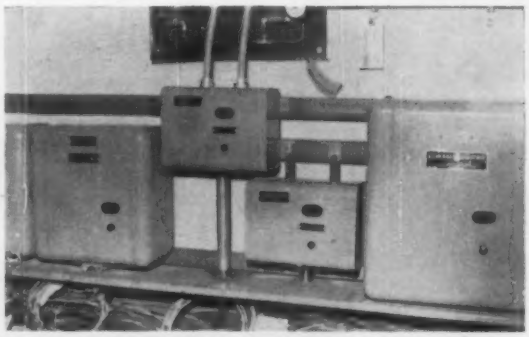
In the modernized layout, electric supply to the building consists of a large ac service for general power and light and a 225-amp dc service for an existing freight elevator. The ac service, rated at 4000 amps, 120/208 volts, 3-phase, 4-wire, is made to an enclosed deadfront, fuse-type switchboard in a basement room adjoining the utility transformer vault. From this board, power and lighting feeders are carried to various distribution panels throughout the building.

Subdivision of the main switchboard capacity is made according to load and metering requirements

ROOF MACHINE ROOM



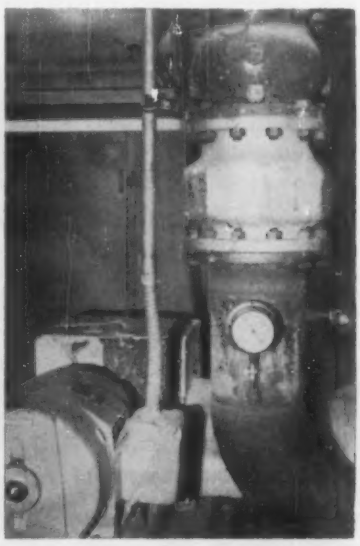
MOTOR CONTROLS for refrigeration equipment and other machine loads are wall mounted between the two 480-volt, 3-phase power panels fed from the basement transformers. One power panel is at left background. Motor circuits originate at fused switches in panels, which provide short-circuit protection and disconnect means.



EFFECTIVE MOUNTING of motor controls is made to angle-iron frame bolted to wall. Frame is secured between power panels. Controls are nippled to long gutter. Wiring from the power panels to the controllers and to the motor loads is facilitated by auxiliary gutter.

STURDY CONSTRUCTION of supply conduits to motor terminal boxes utilizes flex from a "T" fitting to a box, with the overhead rigid supply conduit carried through to a flange on the concrete motor base. This method assures a strong, reliable installation for the conduit coming down from overhead, where no other support can be made for the conduit.

RIGID SUPPORT for overhead conduit supply to motor is here made by a piece of angle-iron bolted to a pipe flange as shown. A clamp holds the conduit, permitting simple transition from rigid to flexible conduit for vibration-resistant supply to motor box.



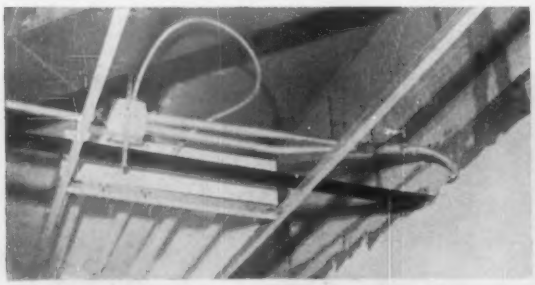
peculiar to this building. As shown in an accompanying sketch, the ac service disconnect and overcurrent protection in the switchboard are provided by three main fused switches. One of these feeds a separate section of bus for feeders to floors three through ten, which will be equipped with local metering for tenants when these floors are occupied. A second of the service mains feeds a bus section supplying building power and light and lighting panels for floors occupied by KLM—floors 1, 2, 11, 12 and 13. The third service main is a spare, to supply an individual feeder to a future tenant. A fourth subdivision of main bus capacity consists of an emergency supply tap from the switchboard main bus.

Building power is supplied from three power panels. One of these is located in the basement and is rated at 120/208 volts. The other two power panels are installed in a refrigeration penthouse on top of the building. These penthouse panels serve refrigeration loads and are supplied at 480 volts, 3-phase, 3-wire from step-up transformers in the main switchboard room in the basement. The 480-volt feeders are carried up to the penthouse in existing conduit risers. Sizes and arrangements of these feeders are shown in the switchboard diagram.

Throughout the building, old conduit was used where possible and was rewired to a fill of more than 40% of the conduit cross-section, as permitted by NE Code Section 346-6. Unusual routings of cables to lighting panels were necessary to dovetail the existing pipe layout with various panelboard requirements and load groupings. In most cases, old panel cabinets were rearranged to accommodate new unit CB panelboards for the modernized circuit layouts. In some cases, old panel cabinets were used only as pull boxes. And in a number of locations, completely new panelboards were installed.

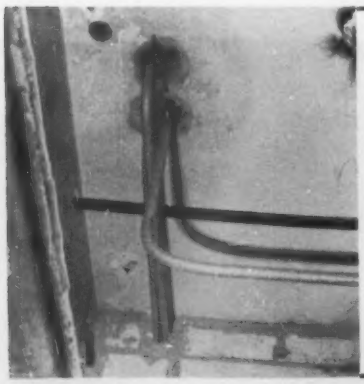
Details of this interesting job are shown in accompanying illustrations. Some interesting job specifications are also given.

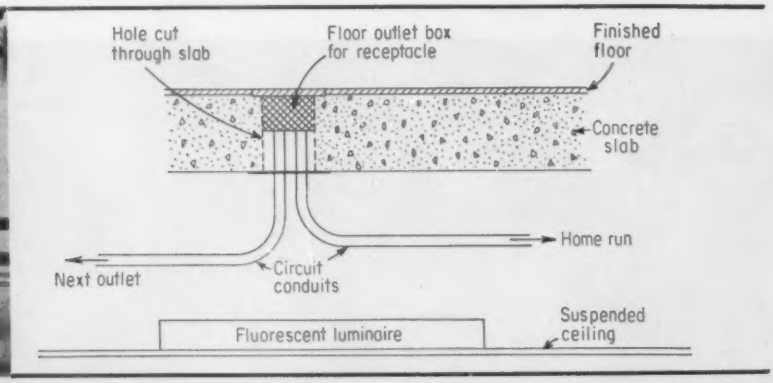
CIRCUITING DETAILS



RECESSED FLUORESCENT luminaires in office areas are fed, as shown, from box bar-mounted to channel of dropped ceiling. Circuit wires are type TW in EMT, with the exception of switch legs where run in the wall. Each such leg is a tightly made-up rigid conduit run to a switch box. Preference for this method was based on assuring a sound, watertight connection through the plaster walls. Each luminaire is fed by No. 16 AF wire in flex.

CHANNEL FRAMING was used to mount industrial type luminaires in roof machine room. Lighting requirements called for three fixtures mounted four feet apart in a line. Because of a high ceiling, with dense congestion due to overhead piping, it was impossible to hang the fixtures in their proper positions using two rod hangers for each unit. Instead, an overall length of channel frame was first supported by three rod hangers, run through to the ceiling where clear passage could be obtained. The luminaires were then bolted to the channel in proper positions, with rigid conduit feed-throughs.





FLOOR OUTLETS were installed throughout office areas of all floors to provide for 120-volt receptacles and telephone outlets. To install such outlets in an existing building could have been done by channeling the floor or by boring holes through floor slabs and feeding the outlets from below. This latter method was chosen, and over 2000 such holes were cut through with the use of a concrete power drill. Supply conduits are looped from outlet to outlet below the floor slab in the plenum chambers above the suspended ceiling of the floor below.

Contractors at Miami Beach

Convention personalities at the annual meetings and electrical trade exposition of the National Electrical Contractors Association held in the Fontainebleau Hotel, Miami Beach, Florida, November 8-12. For the convention report see page 155.

Lyle Foster formerly of Peoria, Ill. and now Fort Lauderdale, Fla., was honored with a Life Membership in NECA; E. J. Stewart, E. J. Stewart, Inc., Morristown, N. J.; Robert J. Bauer, Electrical Installations Inc., Roselle Park, N. J.; F. W. Schenk, Schenk Elec. Co., Chatham, N. J.; Richard Almond, Almond Electric Co., Tulsa, Okla.; Harold A. Webster, T. Frederick Jackson Inc., New York, N. Y.; Ernest R. Edenfield, Edenfield Electric Co., Nashville, Tenn.

L. P. Harvey, Schoolfield-Harvey Elec. Co., Charleston, W. Va.; Morris Dorn, Dorn Electric Co., Maumee, Ohio; Robert F. Johnson, Evans Electrical Const. Co., Kansas City, Mo.; Ed Seeley, Evans Electrical Const. Co., Kansas City, Mo.; Ralph K. Robinson, Robinson Electric Co., Charlotte, N. C.; Fred Vanderlinde, Vanderlinde Electric Corp., Rochester, N. Y.; C. E. Patterson, Buhl & Caffrey, Inc., Newark, N. J.; John A. Anderson, Anderson Elec. Co., Shrewsbury, N. J.

COGGESHALL AWARD was presented to Charles P. Bobe, of St. Louis, Mo., chairman of the NECA Research Committee, for the outstanding service he rendered the industry in developing new methods and techniques in presenting management training to contractors. O. F. Burnett, president of NECA, made the presentation.

JAMES H. McGRAW AWARD Contractors Medal was presented to Edwin H. Herzberg, manager of the Milwaukee Chapter of NECA, for his initiative and leadership in the development and building of the electrical contracting industry's apprenticeship and training program. H. A. Webster, president-elect of NECA, made the presentation.

L. K. COMSTOCK, founder of L. K. Comstock & Co., Inc., New York City, was presented with a testimonial scroll announcing establishment, by the NECA Board of Governors, of a permanent "Louis K. Comstock Award" in the field of Labor Relations. E. C. Carlson of Youngstown, Ohio, made the presentation.

Arthur L. Davis, A. L. Davis Co., West Orange, N. J.; L. F. Tieso, Ralph Tieso, Tieso Electric Co., Minneapolis, Minn.; Ray Meehan, Fischbach, Moore & Morrissey, Chicago, Ill.; Harry F. Fischbach, Fischbach & Moore, Inc., New York, N. Y.; A. L. Bush, Belmont Elec. Co., Inc., New York, N. Y.; A. E. Bertke, Bertke Elec, Co., Inc., Cincinnati, Ohio; F. E. Flynn, Asst. Ch. Mgr., Newark, N. J.; J. E. McKinnes, Watson-Flagg, Paterson, N. J.

Milton Minto, MacNutt Elec. Co., Inc., New York, N. Y.; Ed R. Ismond, Hatfield Elec. Co., Cleveland, Ohio; G. Schaeffer, Carl I. Schaeffer Elec. Co., St. Louis, Mo.; Jim A. Hitchcock, Paul Mendt Elec. Co., St. Louis, Mo.; H. A. Garnatz, National Electrical Contracting, St. Louis, Mo.; J. B. Schaeffer, Carl I. Schaeffer Elec. Co., St. Louis, Mo.; Clifton Whitmore, Jr., Whitmore Electric Co., Inc., Miami, Fla.; John J. Reddington, J. J. Reddington Electric Co., Inc., Boston, Mass.

Byron H. Cutler, Muncie Construction Co., Muncie, Ind.; K. E. Sipfle, The L. E. Myers Co., St. Louis, Mo.; Frank J. Groleau, American Line Builders Chapter, NECA, Dayton, Ohio; W. C. Morris, John C. Morris & Sons, Jersey City, N. J.; J. M. Nairn, Superior Electric Co., Jersey City, N. J.; C. W. Moseley, R. H. Bouligny, Inc., Charlotte, N. C.; J. F. Burns, Burns Electric, Schenectady, N. Y.; C. E. Arnold, C. A. Hooper Co., Madison, Wisc.; F. G. Davie, C. A. Hooper Co.; Madison, Wisc.; W. H. Miller, Miller Construction Co., Orlando, Fla.

C. P. McGovern, Emerson-Garden Elec. Co., New York, N. Y.; J. J. Morrissey, J. P. Morrisey, N. Y., N. Y.; W. A. McAuliffe, Representative, NECA, N Y. C.; M. D. Hoffman, Eastern States Electrical Contractors Inc., N. Y. C.; W. G. Nordling, Nordling-Dean & Co., Inc., Summit, N. J.; E. E. Shipe, John P. Morrissey Electric, N. Y. C.; Herbert A. Johanson, Johanson Electrical Co., Brooklyn, N. Y.; George Hands, Jr., Mgr., Western Ohio Chapter, Dayton, Ohio; Jack I. Stein, Stein Electric Co., Dayton, Ohio; Edgar P. York, York Electric Co., Dayton, Ohio.

G. A. Lang, Emerson-Comstock Co., Inc., Chicago, Ill.; Earle Stewart, J. W. Frommer, and A. R. Munro, L. K. Comstock Co., New York City; H. F. Janick, T. H. Green Electric Co., Inc.; J. J. O'Connell, O'Connell Electric Co.; Alvin Mueller, Dwyer Electric Co., Inc.; W. J. Quinlan, O'Connell Electric Co.; Louis Horacek, Horacek-Hayden Inc.; Emmet Molz, Hickson Electric Corp.; all of Rochester, N. Y.

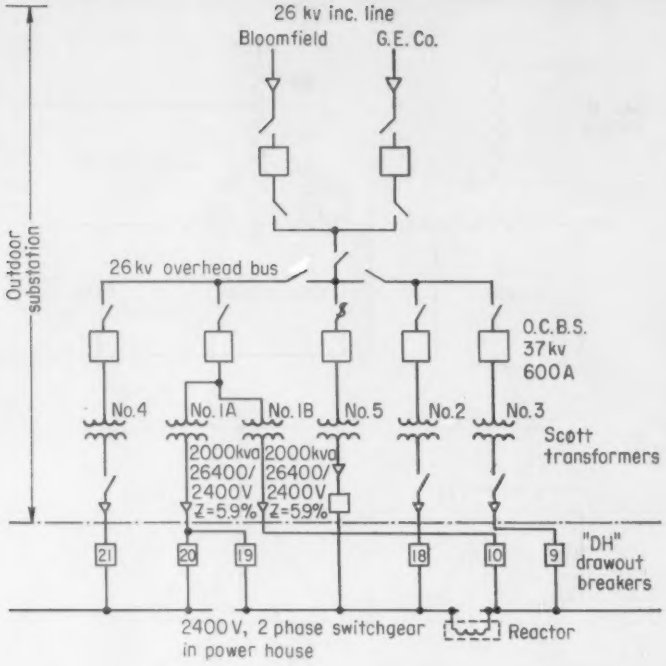


FIG. 1—One-line diagram of the Bloomfield plant's primary power distribution.

A Case Study of . . .

Transformer Phasing

Voltmeter readings simplify the problem of phasing and paralleling replacement transformers.

By K. Chen, *Electrical Engineer, Lamp Division*
Westinghouse Electric Corp., Bloomfield, N. J.

AT THE Westinghouse Lamp Division's Bloomfield plant, 3-phase electric power is obtained at 26 kv from the Public Service Electric & Gas Systems underground feeders, but the plant's 2400-volt 2-phase primary feeders are derived from a 26 kv power supply via six Scott-connected transformers, installed in the outdoor substation during the early part of this century. From there all 2-phase feeders are run in underground ducts and brought into the plant's power house, feeding various sections of 2400-volt buses via type DH drawout breakers. Fig. 1 shows the simplified version of the plant's power distribution one-line diagram.

Recently, one of the 2000-kva, 26.4/2.4-kv Scott transformers developed a winding fault and subsequently had to be rewound. To place this rewound transformer back into service, we were confronted with a phasing and paralleling problem. The following is an account of how it was done.

Let us briefly review the voltage relations of a Scott-connected transformer. This transformer is used to convert from a 3-phase 26,000-volt system to a 2-phase 2400-volt system. As shown in Fig. 2, it consists essentially of two separate single-phase transformers, designated as "AA" and "BB." "AA" is called the main transformer, and "BB" is called the teaser transformer. Primary A of the main transformer is connected for a 3-phase line voltage of 26,400 volts and has a center tap "D." Secondary of "AA" is set for 2400 volts.

With two tap changers provided on the transformer, a range of voltages from 2607 to 2322 volts can be obtained. The primary of "BB" has identical windings to that of "AA," but is connected in such a manner that V_{DB1} equals 0.866 V_{BAB}. Secondary B is also set for 2400 volts.

For a balanced resistive load, the phase relations for both primary and secondary voltages with respect to the current, should be as indicated in Fig. 2.

Phase Shift

While Fig. 2 shows the normal phase relationship between the 3-phase and 2-phase windings of a Scott-connected transformer, there are many possible combinations of phase shift which can be caused by difference in the terminal and winding connections. Typical cases only are illustrated in Fig. 3, in which A, B, and C, represent 3-phase incoming lines, V_{12} and V_{34} represent 2-phase output voltages. Either one phase or both phases on the 2-phase

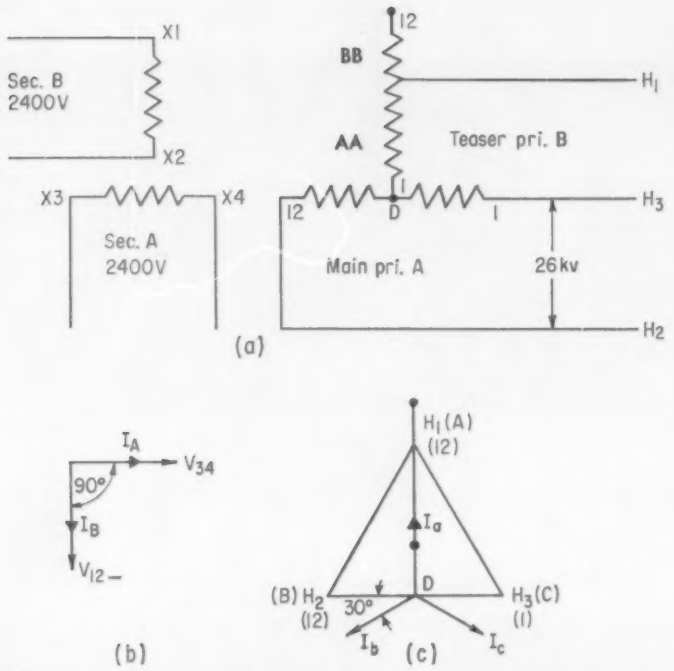


FIG 2—Scott-connected transformers are used to convert from a 3-phase, 26-kv system to a 2-phase, 2.4-kv system. Connection and vector diagrams show the phase relations for both primary and secondary voltages with respect to the current, for a balanced resistive load.

side of a Scott-transformer may be out of phase by certain angles with respect to the identical transformer on the system, merely because the rewound transformer terminals may have been connected entirely different from its identical unit. Determination of this phase shift is a relatively simple matter, and may be found for any given set of connections by making suitable vector diagrams of the two windings involved. However, difficulty or confusion is usually encountered when the vectors are applied to the actual wiring diagrams of the transformers in an effort to fix the proper connections of the numbered leads of the windings. For practical purposes it would be much easier to measure the voltage difference between the two corresponding terminals of the corresponding windings of two identical transformers to be paralleled. Such is the method we used recently in solving the phasing problem.

Paralleling Two Transformers

When two transformers are identical, they can usually be operated in parallel with success. However, after one transformer (No. 1B) is rewound, before it can be put back into service (to be paralleled with transformer No. 1A, Fig. 1, in this case), it must be properly phased out in addition to all other important routine checks, which include checking the transformer linkage connections, oil levels, nitrogen pressures and insulating resistances.

In the course of placing the transformer No. 1B back on the line, the work was started by tripping both outdoor OCB and DH breakers Nos. 10, 19, and 20 at the power house end of the transformer No. 1A (See Fig. 1), thus isolating the entire circuit for both transformers. Work was then started from the outdoor substation and finally completed in the power house after phasing was accomplished. Fig. 4 shows the entire substation view with the exception of transformer No. 5 which is located in a separate area. Transformers are identified from left to right as Nos. 4, 1A, 1B, 2 and 3. When facing the transformer tank from the 2-phase side, the bushing terminals from left to right are identified as X_1 and X_2, X_3, and X_4. (X_1 and X_2 pertain to one phase and X_3 and X_4 to the other.)

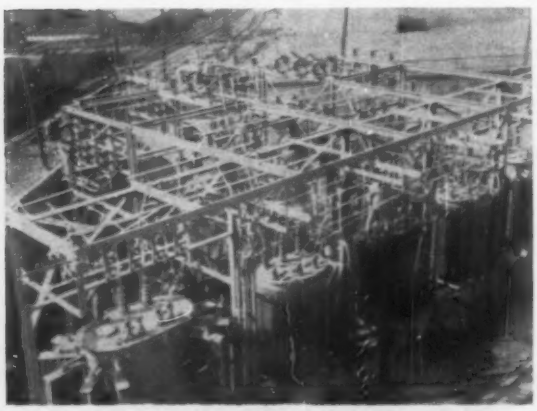


FIG. 4—Complete view of the outdoor substation. Each Scott-connected transformer is rated at 2000-kva. Secondary is 2400-volts, 2-phase.

FIG. 5—Preliminary voltage test is taken with only the primary oil-circuit-breaker closed. Notice the insulating handles for the test leads to the voltmeter.

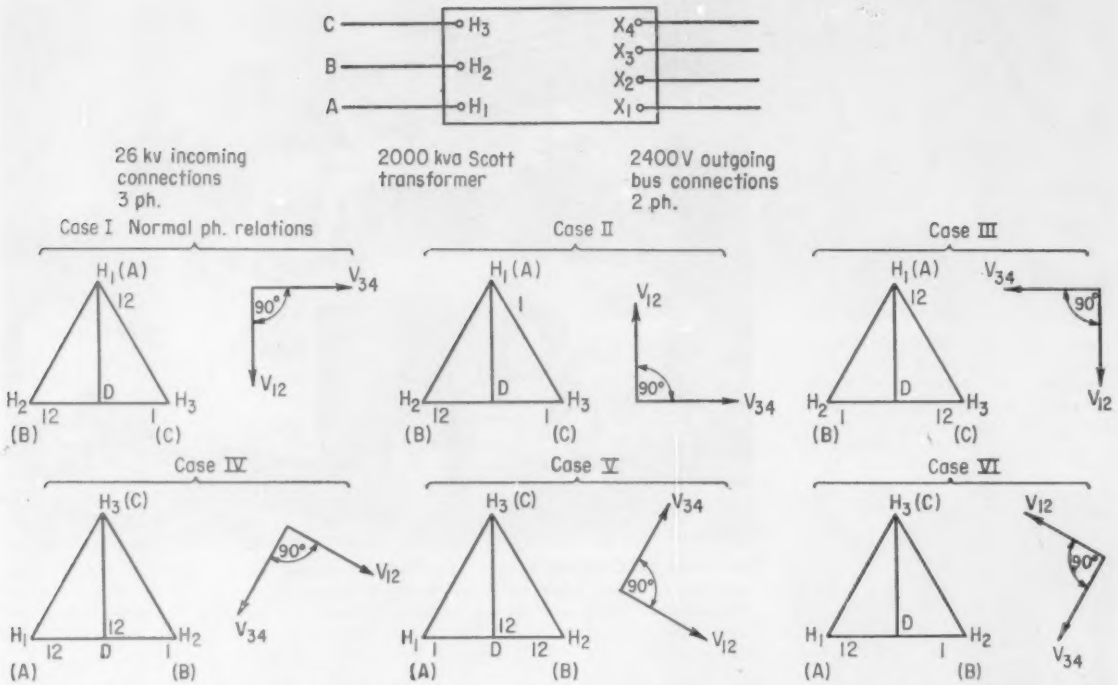


FIG. 3—Typical cases of possible phase shift are caused by different winding connections. Either one phase or both phases on the 2-phase side of a Scott-transformer may be out of phase by certain angles with respect to the identical transformer on the system, merely because the rewound transformer terminals may have been connected entirely different from its identical unit.

After completion of the outdoor work, the 26-kv OCB was closed with a remote-control switch in the power house, thus energizing primaries of both transformers. Voltage readings were taken at the switchgear bus terminals and at the incoming cable terminals. When the DH breaker was drawn out, the mechanic could walk into the stationary housing. With the aid of two specially-insulated hollow sticks through which wires are brought out from its hook and end for meter connections, voltage readings across different terminals are easily registered.

Fig. 5 shows the above tests being carried out. When facing the switchgear cubicle, the breaker's primary disconnecting devices are identified as upper row for bus connections and lower row for cable terminals, and X_1, X_2, X_3, and X_4 from left to right respectively. The voltage readings for the two phases at bus terminals were 2440 volts, and at the transformer 2490 volts. These readings appeared to be perfectly normal with transformer under no load condition.

Next sequence was to close the transformer No. 1A secondary DH breakers, and connect it to the system's 2400-volt buses. Testing rods were placed in the same relative positions as if the tests were being carried out. Two stick rods can be inserted in the upper and lower holes (primary disconnecting device of the transformer No. 1B secondary DH breaker) corresponding to X_1 first, and then X_2.

A properly scale voltmeter which must be connected through a type PV-130 potential transformer to the stick rod's cable ends showed no reading for both cases. This assured us that this particular phase of the transformer No. 1B had been properly connected all the way from the outdoor overhead bus to the DH breaker terminals.

Similarly, the tests were conducted on the other phase and results were the same. Two Glowtector sticks (properly insulated for up to 15 kv, with disc mounted in the middle section to serve as a safety margin) were used to detect whether each terminal was properly energized prior to the measurement of potential difference between terminals.

The final phase of the work was merely to close transformer No. 1B secondary breaker. The phasing was thus successfully concluded.

Test Readings

During the above tests, if the voltmeter indicated readings across the corresponding terminals, it meant that the phase terminals in the outdoor substation had not been properly connected for parallel operation. Based on the vector relationships, as shown in Fig. 3, the typical possible voltage readings would be 0 (Case II, V_{34} and Case III, V_{12}), 2400 (Case IV, V_{12}. Case V both V_{12} and V_{34}), 4150 (Case IV, V_{34} and Case VI, V_{12} and V_{34}), or 4800 (Case II, V_{12} and Case III, V_{34}).

Differences in voltage readings can be used to serve as a clue to what has to be done in the outdoor substation in order to achieve correct phase relationships. Additional work will then be involved to cut or extend copper tubings so that the necessary bus connections can be swapped. But in principle, the above illustrated method, depending on only simple instruments, shall always be a valuable tool to the problem of phasing and paralleling transformer connections.

DESIGNED SPECIFICALLY for maintenance of outdoor lighting fixtures, Valley Flood-Lite Service trucks have aerial ladders that extend 35 ft in any direction. Mounted atop rugged bodies and chassis, counter-balanced ladders may be easily swung and raised manually, then locked securely in position to provide rigid support for men working aloft.

Mike Henges of Valley Flood-Lite Service, North Hollywood, Calif., had a hunch that . . .

Maintenance Specialization Pays Off

. . . so he selected a limited-scope high-potential field, designed equipment for specific purposes and trained his crews to do a few things very well.

By Hugh P. Scott

PROOF that a service organization need not be physically large or diversified in nature in order to be successful is well illustrated by a small lighting maintenance organization located in California's sprawling San Fernando Valley.

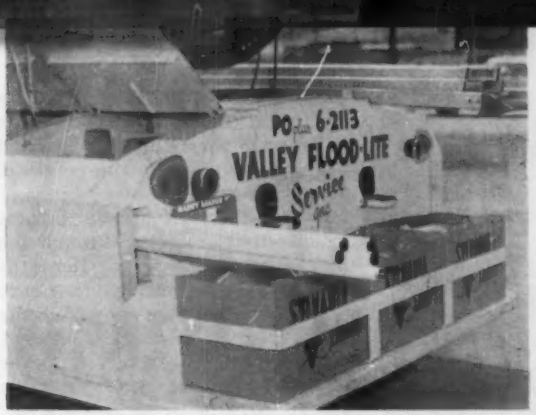
It is a region of super highways. Cars by the thousands provide the primary means of transportation. Gas stations, parking lots and outdoor car dealers are big business.

In this situation Mike Henges, co-partner of Valley Flood-Lite Service, saw a fertile field for a company wishing to specialize in the maintenance of outdoor lighting units.

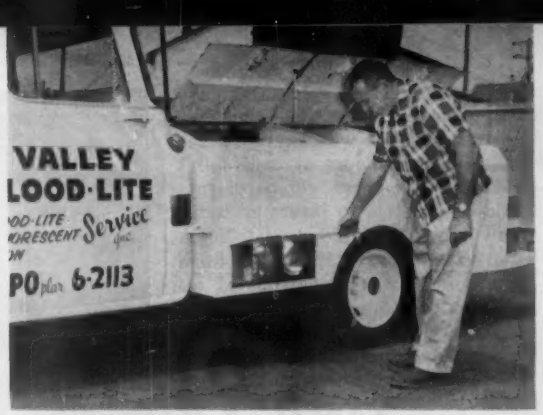
Henges noted that each gas station and car lot had a liberal array of exterior fixtures with which to meet competition from near-neighbor stations and lots, and he reasoned that here was a lively service opportunity.

With thousands of stations concentrated in the area, wasteful travel time between job-sites could be minimized. Moreover, with a smaller number of work routines involved, it would be possible to quickly train work crews to handle assignments proficiently. And, with such a specialized field of service, it would also be possible to reduce warehouse inventories and variety of equipment necessary to perform an outstanding job.

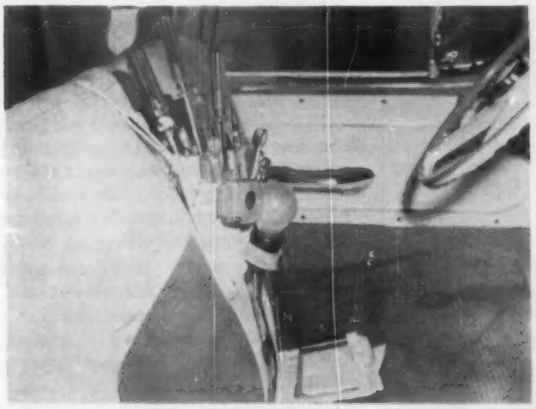
In considering routines and inventories, a rough survey indicated that about 15 different types of floodlight units were in general use throughout the Valley in those categories of application being contemplated. Of this number, however, over 75% had shovel-type reflectors that involved only five basic combinations of sizes and contours.



TRUCK BODIES constructed from heavy diamond-plate sheet-steel sections continuously welded at intersection lines contain numerous compartments dimensioned to hold specific items. For example, hinged-cover compartments running full length of body and located over fender wells hold slimline lamps that can be removed from either front or back.



SPACE ABOVE AND ALONGSIDE WHEELS is put to practical use since entire enclosure of truck body consists of compartments that open upwards or to the sides. Small compartments near bottom of chassis hold such items as floodlamps and transformers, while larger bins above hold wiring materials, cleaning agents and the like.



LEATHER HOLSTERS, conveniently suspended over backrest of driver's seat when not being worn by worker-on-assignment, contain variety of small tools, light meter, test lamp and tape. Interiors as well as outsides of trucks are kept spotless by frequent vacuum-sponge-wax routines performed by company employees in Valley's main shop.

REPLACEABLE REFLECTOR LINERS are washed in batches in main shop, then are allowed to drip-dry on racks located adjacent to detergent and rinse tanks. When liners become badly pitted or deeply stained through long service in deleterious atmospheres (note reflector at left, above), they are returned to manufacturer for thorough reconditioning.

This pattern of similarity suggested a simplified cleaning procedure, for it seemed more feasible to insert clean reflector liners in the field and to clean replaced units later at a central plant, rather than to clean reflectors in place with men working atop ladders for longer periods. This procedure would also minimize quantities of related cleaning agents and materials to be carried to job-sites. And, since cleaning would be completed at ground level rather than in elevated locations, the possibility of injury due to slipping and falling would likewise be minimized.

Trucks Are Key Factor

Since all lighting fixtures in these various outdoor locations are elevated, the biggest problem was how to put workers up in the air light-high quickly and safely. The obvious answer was to use trucks equipped with aerial ladders. This would make it possible to drive directly to job-sites, swing and elevate ladders to desired positions, or to move progressively along rows of fixtures mounted on poles-in-line, on messenger cables between supports, or atop roof parapets. It likewise was obvious that trucks fitted with bins and compartments to carry lamps, tools and other items related to the complete maintenance of several basic lighting systems would be essential to the project's success.

Designing trucks to meet these specific requirements received considerable consideration and the resulting vehicles can be listed as key factors in the company's efficiency.

Mounted on ¾-ton GMC cab-chassis units, these trucks support sturdy diamond-plate steel bodies containing hinged-cover compartments that variously open from top decks, sides or tail surfaces of the steel bodies. Compartments hold not only standard lamps and sockets but also such items as spools of insulated wire, mogul and extension sockets, neon transformers, switches, time clocks, automatic photocell contactors, necessary tools and other items of equipment related to fundamental lighting and wiring needs.

Compartments were designed with dimensions corresponding to specific storage requirements. For example, as indicated by an accompanying photo, 8-ft slimline lamps are carried in separate compartments running the full length of

each truck body, located along each side and occupying the space directly above rear wheels and fender wells. Hinged doors at both front and rear of these compartments make it possible to insert or withdraw tubes from either end.

A broad rear step or platform is provided to carry cartons of replacement reflector liners, while top decks support (1) pivoted, counterbalanced boom ladders that can be manually swung to any azimuth or declination within a 35-ft reach, and (2) nests of lightweight auxiliary A-frame extension ladders that can be used in locations not suitable for truck manipulation.

Construction of these auxiliary ladders merits an added comment, for the units are unique 3-section assemblies that can either be (1) leaned against a vertical support and extended to their full 30-ft height in normal fashion, or, as pictured in an accompanying photo, (2) erected as self-supporting units, with two sections spread to form a sturdy A-frame base while the third section may be raised to a height of 20 ft if required. As noted, pivoted skidproof feet, various sideguides, limit stops and rung grips are provided for maximum safety-in-use.

COUNTERBALANCED ladder can be extended to 35-ft height or manually rotated and changed in declination to reach any desired position within that same radius. When lowered and retracted, ladder drops forward over truck cab but does not overhang front bumper.

UNIQUE 3-SECTION LADDER can be used either as a self-supporting A-frame unit with an overall reach of 20 ft, or as a conventional 3-section-in-line unit with a total length of 30 ft. Skidproof feet, side guides, rung grips and limit stops are safety features. Lightweight construction permits ladder to be handled by single man.

Truck bodies, liberally equipped with slip-proof step treads and scuff-plates to promote firm footings and lessen mar marks, are white enameled; their attractive appearance being maintained by frequent washings and spray-enameling by company employees. Overall weight of trucks (excluding cleaning and replacement items) is 2½ tons gross.

Within cabs proper, specially-designed leather bolsters (secured to backrest cushions when not being worn by driver-workers) carry such additional items as wrenches and pliers, screw drivers and wire cutters, footcandle meters and test lights, tape and wire nuts.

Central Cleaning Station

As noted earlier, light output of outdoor fixtures is kept constantly high by replacing reflector liners on a monthly basis; liners so replaced then being returned to the main shop for cleaning, replacement in stock and subsequent re-installation in other floodlight units on a continuous rotating basis.

By cleaning many liners at one time and in a single location, production-line efficiencies can be obtained through the use of large detergent tanks, rinse tanks and drying racks. Racks are sufficiently extensive to hold all liners being washed in a typical batch, and liners are placed cup-downwards on racks in order to permit drip-drying and prevent spotting during natural air-drying cycles.

When liners eventually become badly pitted or dulled through the inevitable action of road fumes or salt-laden atmospheres, they are either (1) aluminum sprayed in the Valley shop or, in advanced cases of deterioration, (2) returned to the manufacturer for respinning on grinding and polishing heads.

Since the liner-cleaning shop has one wall completely equipped with roll-up door sections, air movement for natural drying and for ventilation is excellent. This door arrangement also makes it possible to use the space as a garage area for truck storage at nighttime and over weekends, or during periods when trucks are being lubricated, repaired or spray-enameled.

In addition to this combination cleaning station and garage, the main shop also contains a modern office, dressing rooms and shower facilities, also a central stockroom where bulk supplies of lamps, tools, detergents and other essential maintenance items are stored.

Office space is air conditioned; an intercom system permits paging and conversation between departments, and radio-received music can be disseminated to several locations through extension speakers for the benefit of shop employees performing routine jobs.

Due to the concentration of gas stations, parking and car lots in this section of the country, this small maintenance organization has been able to secure over 350 clients (representing several thousand floodlight units) within a relatively small area; most of them being located within a 10-mile radius of the shop.

In typical instances, reflector liners are replaced monthly and day-or-night call-back service is provided to replace burn-outs and handle emergencies. Routine maintenance is billed monthly on a fixed-fee basis depending upon such factors as numbers of fixtures involved, their heights, locations, construction details and the like. Items such as lamps, transformers and switches are billed in addition on a cost-plus-modest-profit basis.

So that's the story of an admittedly "small-time operator" who does only one thing—but who does that one thing exceptionally well.

THE Pennsylvania NEWS

EXTRA

Published by Pennsylvania Transformer Division • McGraw-Edison Company • Canonsburg • Penna.

PENNSYLVANIA TRANSFORMER ANNOUNCES COMPLETE LINE OF SECONDARY UNIT SUBSTATIONS AND LOW VOLTAGE SWITCHGEAR

Products Include Indoor and Outdoor Substations, Articulated and Integrated

A complete line of secondary unit substations and low voltage switchgear assemblies is now being manufactured by Pennsylvania Transformer Division, McGraw-Edison Company. Products include both indoor and outdoor articulated and integrated substations.

Announcement of the new products was made by W. R. Swoish, vice president, who reported the opening of special departments to handle manufacture and sale of the products. Manufacturing facilities and offices are adjacent to the company's main transformer plant in Canonsburg, Pa.

Ratings from 75 through 2000 Kva

According to Mr. Swoish, Pennsylvania's new articulated substations, which consist of subassemblies for field connection, range from 112½ through 2000 kva. Integrated substations, which are completely assembled at the factory, range from 75 through 500 kva. Normal primary voltages are from 2400 through 13,800 volts, with secondary voltages 480 volts and below.

Substations may be equipped with any of several suitable transformers manufactured by Pennsylvania. Indoors, sealed dry-type, ventilated dry-type, or askarel-filled transformers are used. Outdoors, oil-filled transformers normally are used.

Switchgear Features "Tilt" Design

Outgoing feeder switchgear—normally of the 600-volt insulation class—may include either low voltage power circuit breakers or molded-case breakers. A feature of Pennsylvania's draw-out switchgear is a special breaker-tilting arrangement that provides easy access for adjustment of trip settings.

The various types of switchgear also are available as separate assemblies for subsidiary distribution centers.

Pennsylvania's Transformer's new line of secondary unit substations includes both indoor and outdoor substations, both articulated and integrated designs. Pictured is a 1000-kva articulated, indoor substation rated 4160—480Y/277 volts. The substation includes a primary, fused, air interrupter switch, an askarel-filled transformer, and secondary drawout switchgear with a special "tilt" breaker design.

J. J. Zimsky

T. S. Banghart

Sales, Production Heads Named for Pennsylvania's Unit Substation Department

A product manager and a sales manager have been named for Pennsylvania Transformer's new secondary unit substation department. Product manager is J. J. Zimsky, who formerly headed the company's planning department. Sales manager is T. S. Banghart, whose experience includes six years as switchgear application engineer.

Introduction of New Products A Habit at Pennsylvania

A check of the records today revealed that new product announcements are by no means uncommon at Pennsylvania Transformer Division, McGraw-Edison Company. Counting the latest announcement, regarding secondary unit substations and low voltage switchgear, at least three such announcements have been issued by the Canonsburg, Pa., manufacturer within little more than a year.

The other two announcements involved the Pole Star Regulator (introduced in 27 single-phase distribution ratings) and the Pennsylvania Phase-Isolated Load Tap Changing Transformer. A Pennsylvania innovation, the Phase-Isolated LTC is a three-phase transformer that features individually controlled voltage regulation for each phase.

In addition to secondary unit substations and low voltage switchgear, Pennsylvania products now include a complete line of transformers and regulators, from the smallest pole-type to the largest station units being made today.

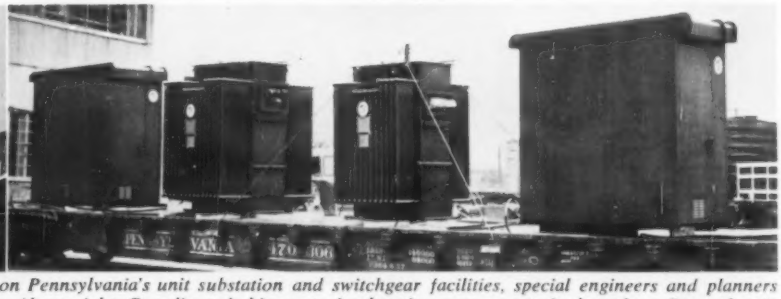
PENNSYLVANIA UNIT SUBSTATIONS DESIGNED, ENGINEERED AND MANUFACTURED UNDER 1 ROOF

Centralized Responsibility Assures Coordinated Shipment

From development to production, all components of Pennsylvania Secondary Unit Substations are designed and engineered under one supervisory helm. Switchgear and transformers are sure to complement each other in both appearance and quality. In addition, ease of field installation is assured.

With manufacturing and assembly of all switchgear assemblies and transformers being handled at one plant, completely coordinated production is assured. All components can be shipped together, thereby avoiding delay at the installation site.

A portion of Pennsylvania's unit substation production floor, showing some of the sheet-metal-working machinery in the foreground.



Above left: Before beginning actual work on Pennsylvania's unit substation and switchgear facilities, special engineers and planners studied scaled model layouts as shown here. Above right: Coordinated shipment of substation components is the rule at Pennsylvania Transformer. Switchgear assemblies and transformers are produced at the same plant.

Equipment Laid Out for Streamlined Production Flow

A highly efficient, completely new production-line arrangement has been established for Pennsylvania unit substations and switchgear. All equipment and layout requirements were predetermined by specialized engineers and planners.

Detailed models of all equipment, arranged in a scaled factory layout, were of tremendous benefit, the company reports, in determining the choice of machinery, the flow of materials, and even the selection of colors for equipment and walls.

OVER 30 YEARS' EXPERIENCE IN TRANSFORMER MANUFACTURE INCLUDES MANY SUBSTATION APPLICATIONS

In more than 30 years of transformer design and manufacture, Pennsylvania Transformer Division, McGraw-Edison Company has produced every type of transformer from small distribution pole-type units to the largest size power transformers. To date, transformers have been manufactured in capacities over 300,000 kva and in voltages up to 460 kv.

Many transformers have been produced in the past for use with secondary unit substations assembled by other switchgear manufacturers. Thus, Pennsylvania enters the secondary unit substation field with a substantial store of information and experience regarding the applications involved.

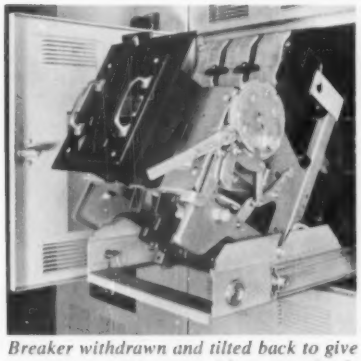
Production of LTC Equipment Prepares Personnel for Manufacture of Secondary Unit Substations

In addition, Pennsylvania Transformer has a nationwide reputation for quality in various other related fields, such as the design and manufacture of load tap changing equipment and other types of transformer switches. Single circuit primary unit substations have been a Pennsylvania product for many years.

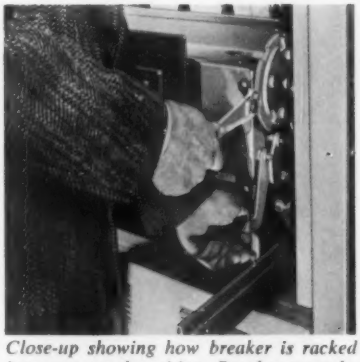
Experience from the manufacture of such a wide variety of equipment has developed in Pennsylvania a large pool of engineering knowledge and production know-how. Personnel has been well trained to handle the manufacture of secondary unit substations.

Pennsylvania Transformer Assumes Complete Responsibility for Materials and Workmanship

The Pennsylvania Transformer Division of McGraw-Edison Company assumes full responsibility for all materials and workmanship in its new line of secondary unit substations. The company points out that this is the long-established policy for all Pennsylvania products.



Breaker withdrawn and tilted back to give easy access to trip units without completely removing breaker element from carriage.



Close-up showing how breaker is racked into connected position. Breaker must be opened and positive interlo·k released before breaker can be moved.

Tilt-back Feature Facilitates Inspection and Maintenance

Several unique features have been incorporated in the design of Pennsylvania's draw-out carriage and racking mechanisms for power circuit breakers.

In the withdrawn position, the breaker can be tilted back on its rear trunnions so that the trip elements and other parts below are easily accessible for maintenance and adjustment.

The racking mechanism is operated with a self-storing captive handle. Not only are positions positively indicated, but also the mechanism is positively locked in all positions: "CONNECTED," "TEST," and "DISCONNECTED" — and the breaker cannot be closed between these positions.

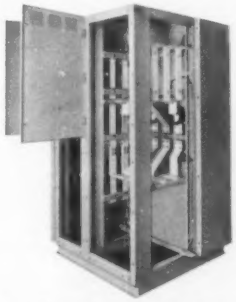
Before the racking mechanism can be operated, it must be unlatched with a finger lever. Movement of this latch is blocked when the breaker is closed. In any intermediate position of the racking mechanism, the trip lever is held in the operated position, preventing closure of the breaker.

The compartment door can be closed with the breaker in any position. A frame, under spring pressure around the mechanism throat, moves back, allowing the mechanism to extend beyond the compartment.

L V Switchgear Assemblies Are of Unitized Construction

Indoor assemblies for the outgoing feeders of Pennsylvania secondary unit substations are of sectional construction, with a stack of breakers in the front compartment and a bus structure in the rear. All parts are made of formed, sheet steel, spot welded together when possible for utmost strength and rigidity. Sections, as required, are bolted together and to a rigid, structural-steel base frame designed to permit easy movement of the equipment.

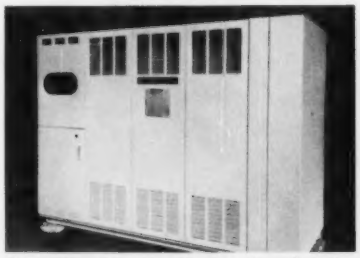
When the switchgear is for outdoor installation, a weatherproof outer "skin" is added to provide an operating and maintenance aisle in front of the breakers. All joints of this outer steel inclosure are gasketed to make them water- and dust-tight. Doors,equipped with 3-point latches and 3-point hinges, are fully gasketed. Ventilating openings have metal filters that are easily removed for cleaning.



Rear view of main breaker compartment.

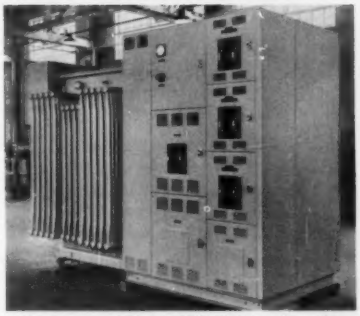
Outdoor switchgear with walk-in aisle.

Indoor Integrated Substation



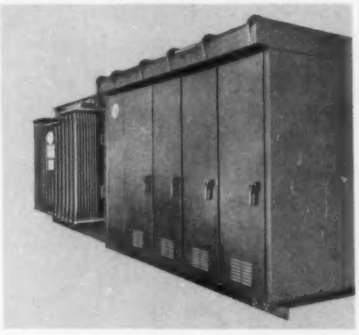
Pennsylvania secondary unit substation rated 500 kva, 2400 — 208Y/120 volts. The transformer is a ventilated dry-type.

Indoor Articulated Substation



1000 kva, 4160—480Y/277 volt substation, with askarel-filled transformer, 1600-ampere main secondary and 600-ampere feeder breakers.

Outdoor Articulated Substation



This outdoor substation with oil-filled transformer is rated 1500 kva, 12,470—480Y/277 volts.

Complete Range of Sizes Now Available

The new line of secondary unit substations announced today by Pennsylvania Transformer Division includes both indoor and outdoor types, articulated and integrated design. Available sizes are:

Articulated—112½ through 2000 kva

Integrated—75 through 500 kva

Supply-side voltage ratings normally are from 2400 through 13,800 volts, with load-side voltages 480 volts and below.

Vacant Breaker Position Easily Converted for Use

Front view, circuit breaker cradle and carriage assembly.

Breakers can be easily installed in the vacant compartments of Pennsylvania secondary unit substations. The blank back plate is removed, permitting a jig-assembled breaker cradle and carriage to be inserted and bolted into place. Jumper bars are installed between the bus and the stationary breaker terminals of the cradle.

If desired, any compartment can be equipped with a cradle and carriage already installed, and the breaker element can be added when needed.

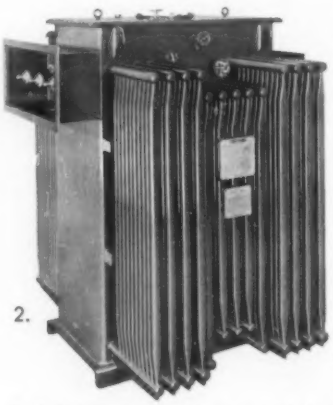
Variety of Incoming Line Sections Available

Outdoor fused interrupter switch with weather-protected aisle.

Supply circuits for Pennsylvania secondary unit substations can be terminated in any one of several types of primary switchgear, the company reports. Frequently used is an air interrupter disconnect capable of opening the normal load on the substation. Power fuses are often included with the switch. Lightning arresters can be connected to these circuits for protection of the transformers.

Fused switches are arranged so that the fuses are not accessible until the switch is opened. Outdoor inclosures have weather-protected aisles to permit maintenance and changing of fuses during adverse weather.

1.



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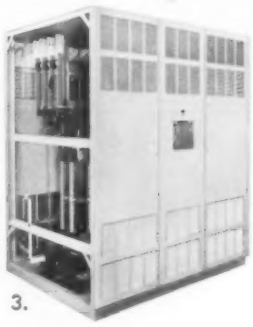


3.

1. *Sealed dry-type transformer with low voltage throat for connection to switchgear.*
2. *Oil-immersed, self-cooled transformer with high and low voltage throats. Can be supplied with flanges for close coupling to switchgear. (Askarel-filled transformers are similar in appearance to oil-filled units.)*
3. *Ventilated dry-type transformer, showing low voltage end for connection to switchgear.*

Four Main Transformer Types with Selection Depending on Application

The location and conditions of the installation determine the type of transformer selected for Pennsylvania secondary unit substations.

For indoor installation, dry-types are commonly used — either open ventilated or sealed. Another type used with indoor substations is the askarel-filled transformer. Each of the three has its own special qualifications for particular locations.

For outdoor installations, oil-filled transformers are used most often. Under special conditions, it is advisable to use askarel-filled or sealed dry-type transformers.

Pennsylvania . . . A Leading Manufacturer of Transformers for over 30 Years

Since the company was founded in 1929, Pennsylvania Transformer has grown steadily, during the years of the depression as well as in the boom times that followed. From the standpoint of quality as well as production, it has maintained its position as one of the leading transformer manufacturers in the country.

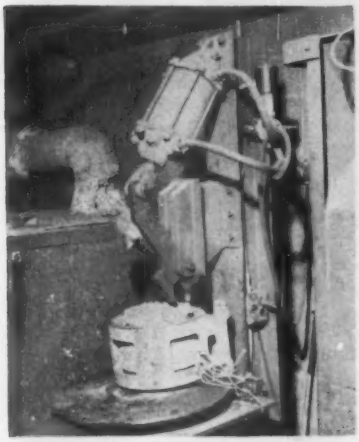
Pennsylvania Transformer became a division of McGraw-Edison Company in 1952. All manufacturing facilities—comprising nearly one million square feet—are located in Canonsburg, Pa., 18 miles south of Pittsburgh. The plant is shown at left.

Write for Copy of Pennsylvania Secondary Unit Substation Book

This well-illustrated 44-page booklet contains descriptions of secondary unit substation and switchgear components, as well as application data. Write on your company letterhead.

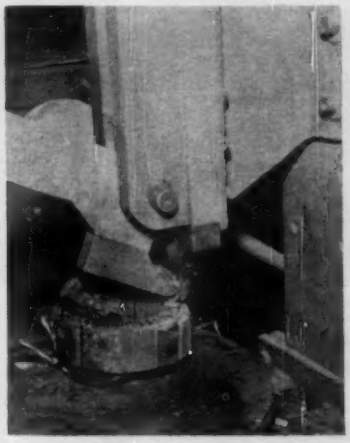
PENNSYLVANIA TRANSFORMER DIVISION
McGRAW-EDISON COMPANY, CANONSBURG, PA.

McGRAW-EDISON



PNEUMATIC COIL-CUTTER speeds stripping operations in Lenawee shop; permits fast clipping of old windings before stators go into burn-out oven. Air cylinder at top operates cutting head.

HYDRAULIC JACK raises or lowers stator table to working height. Turntable accessory permits rotating large stators during cutting operation. Air-cylinder foot-pedal is at right.



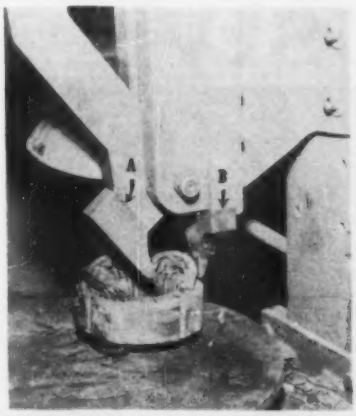
JAWS CLOSE when operator presses air-cylinder foot-pedal. Cutting claw slices through winding at frequency to suit operator. Photo below shows the jaws in the open position.

Coil-Cutting Time Cut

Time is an expensive commodity in a motor repair operation. Any man-hour reductions, while still maintaining quality workmanship, boost shop efficiency and increase customer service and satisfaction. That's why many shops, like Lenawee Electric Company of Adrian, Mich., are constantly improving and mechanizing specific operations.

At Lenawee, such cost-cutting and time-saving begins at the very start of a major repair operation—in the stripping department. Latest piece of equipment to be added is an air-operated coil-cutting device to clip coil ends before stators are placed in an adjacent burn-out oven. Now, one end of a motor winding can be removed completely within a few minutes.

Designed and built in the Lenawee shop, the unit is a simple I-beam pedestal with an air-cylinder and cutting-jaw linkage at the top and a hydraulically positioned table with a revolving plate on which the stator rests. The main upright is a 78-in. length of 6-in. I-beam welded and bracketed to a 26-in. by 20-in. by 1-in. steel floor plate. This base also supports a 1-ton hydraulic (high-lift, pumped-type) jack which raises and lowers the stator table. Basic table consists of a 20-in. by 20-in. steel plate I-beam mounted to a vertical slide which rides the upright flange to assure rigidity at any height within the prescribed jack range.



JAWS ARE OPEN when stator is positioned on table. Rocker arm has tool-steel cutting claw (A). Linkage bracket supports tool-steel backstop (B) for claw.

A bearing-mounted turntable attachment facilitates rotating large stators during the cutting operation. A 21-in.-dia steel plate (¼ in. thick) is welded to the outer race of a large ball bearing. A placement pin, welded to the bearing inner race positions the turntable on the elevating stator table.

Cutting power is provided by a 6-in. air-cylinder (12-in. stroke, 105 lbs pressure) pivot-mounted to the top of the pedestal upright. A sturdy steel bracket supports the cutting linkage; is bolted to the upright about 24 in. from the top; provides about 7-in. clearance between upright and cutting jaw anvil (backstop). One end of the linkage rocker arm is pinmounted to the air-cylinder plunger; the other end has a removable, hardened tool-steel cutting "claw" which clips the windings as it presses against the 1-in. wide (at pressure point), ½-in. thick steel anvil. Leverage advantage is about 4 to 1. An adjustable-bracket, shaded light concentrates lighting on the cutting area so coils can be safely clipped close to the stator laminations.

For routine operation, stators are laid on their side on the turntable, leveled on wood blocks, and positioned so the outer edge of the winding rests against the "anvil." Foot-pumping of the hydraulic jack adjusts table height to prescribed clearance between cutting claw and laminations. Then, with both hands free to rotate the stator, the mechanic operates the foot switch control of the air cylinder. Cutting-stroke speed can be slow, moderate, or high as required.

Hinged Wire Wheels Strip Coil Leads

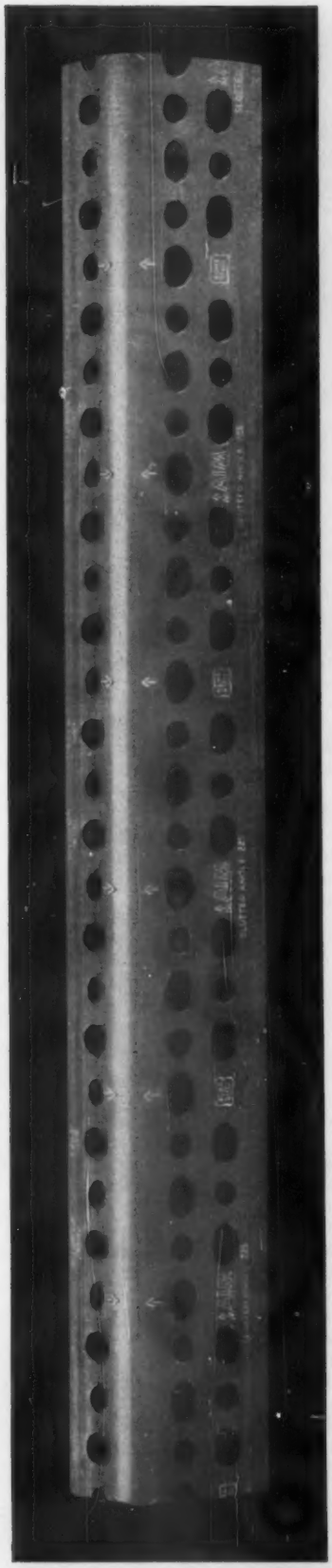
A simple shop-made jig consisting of two wire-brush wheels greatly simplifies the skinning of coil leads in the shop of the Pennsylvania Electric Motor Co., Philadelphia.

TWO WIRE BRUSHES revolving at high speed in opposite directions cleanly strip insulation from ends of coil leads in preparation to their connection. Rotation of lower wheel is initiated when contact is made between it and its upper counterpart.

As noted in the photo, the upper wheel is driven directly by a belt that couples the brush spindle to the drive motor, while the lower wheel is spun with a counter-rotation when it is raised to come into contact with its upper counterpart. Since the lower brush spindle is supported by a metal sleeve which in turn is hinged to the main vertical plate support for the rig, it automatically drops down and forward when not in use, yet can be easily raised for its intended purpose when so desired.

This high-speed twin-wheel unit does a fast, clean job of skinning wire insulation and burnishing the exposed leads and is in constant use as a handy aid in the preparation of coils. Control of the drive motor is by foot-pedal switch, thereby leaving both hands of the operator free to (a) raise the lower wheel manually and (b) insert lead ends.

FEATURES OF NEW MOTORS are studied by Ed Lloyd, shop superintendent at the Lloyd Electric Co., Roanoke, Va., who has been told by many of his customers that "we bring our work to you because you talk with the sound of knowing."



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- ☐ Ideas-In-Action Reports

Mail to: Dept. EBD-129
Fabricated Materials Division
Acme Steel Company
Chicago 27, Illinois

NAME and TITLE_____

COMPANY_____

ADDRESS_____

CITY_____

STATE_____

Compact Lift Truck Increases Storage Space

By employing a narrow lift truck equipped with a small metal platform that may be raised to a 6-ft height, it is possible to reduce the normal width of aisles in a given stock area and thereby increase storage space by being able to place more shelve sections in the same storage space. This is the experience of Joe Previty, owner of the Pennsylvania Electric Motor Co., who employs such a unit in his Philadelphia shop.

Power to lift motors to desired heights for transfer to or from tierred shelves is created by foot-pedal action, a hydraulic plunger and a chain loop running over related sprocket wheels.

Since width and depth of truck are compact, and since the base is fitted with rubber-tired wheels in front and with swiveling castors at the rear, the unit can be pushed through aisles of minimum width, and can be turned within a minimum radius.

As noted in the accompanying photo, stock shelves are supported by cross-braced struts and perforated angles bolted together as shown. Rigidity of sections is furthered by continuous angles running across top of all components, thereby solidfying the entire assembly and also creating an additional overhead large-area storage level which may be reached by ladder secured to shelf section directly behind lift truck.

Fast location of motors so stored is facilitated by lettered stock sections and numbered shelves. Three-level castored dolly visible at right rear of picture is also used to simplify transfer of motors-in-quantity between storage area, sales counter and various repair departments.

Designed to give you *Double Protection!*

WAGNER TYPE DP MOTORS

PROTECTED against corrosion...

PROTECTED against splashing liquids...

WM59-9

Wagner Type DP Motors provide *double protection* that means longer life—more versatility of application. Rugged cast iron frames and endplates are highly resistant to corrosion. Dripproof enclosures are so well designed that these motors can handle many applications that formerly required splashproof motors. These motors pack ample power into little space, are light in weight and are easy to maintain.

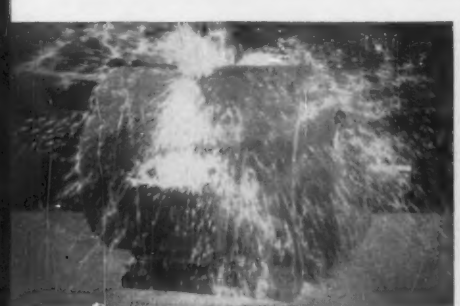
SLEEVE BEARING MODELS AVAILABLE. The entire line of ratings is available with ball bearing construction, or with steel-backed, babbitt-lined sleeve bearings of high load carrying capacity that provide quieter operation.

Let a Wagner Sales Engineer show you how these motors can be applied to your needs. Call the nearest branch office or write for Wagner Bulletin MU-223.

Branches and Distributors in All Principal Cities

Wagner Electric Corporation

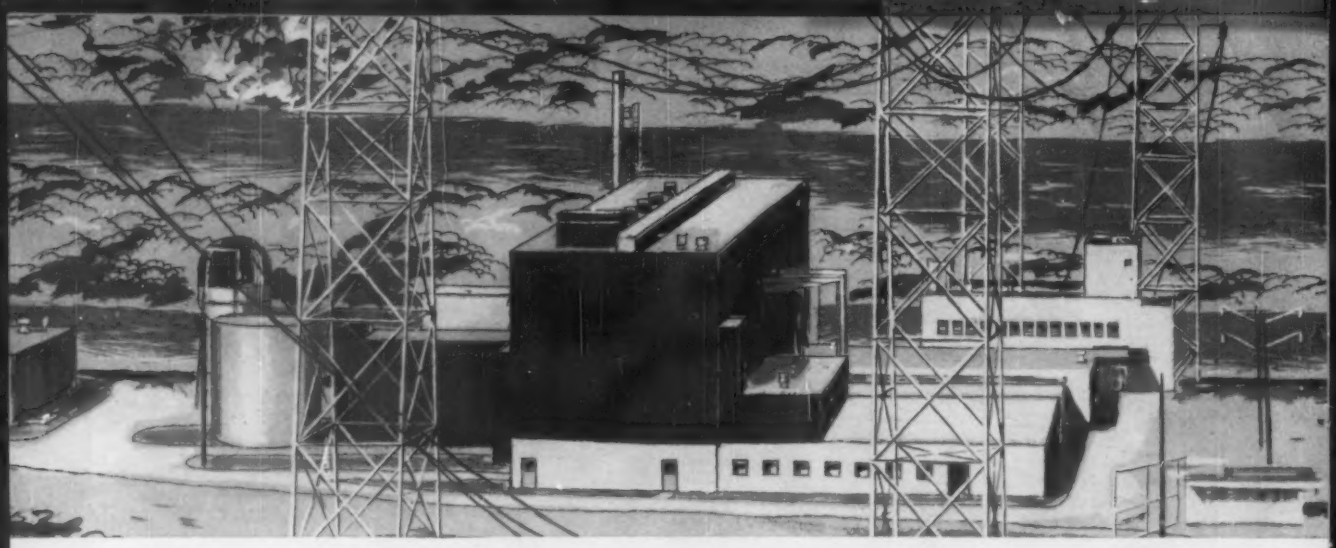
6413 Plymouth Ave. • St. Louis 14, Missouri



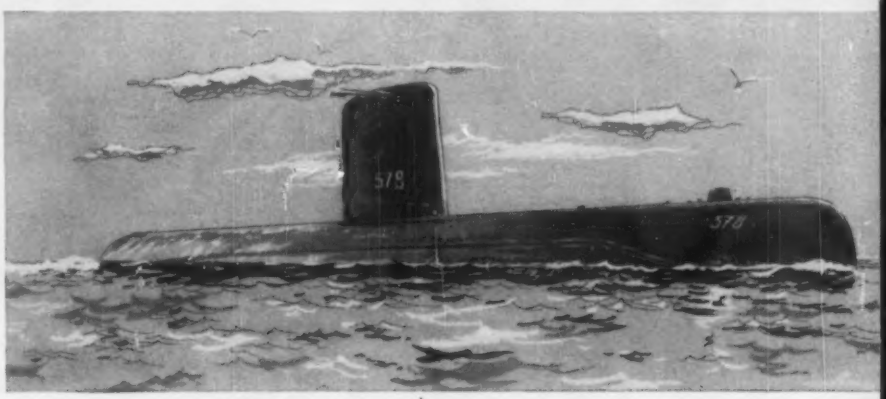
DOUBLY PROTECTED—Air intakes and outlets are positioned to provide complete protection against dripping or splashing liquids. Rugged cast iron frames protect against rough handling and corrosion.

COOLING RUNNING—Specially designed baffles, which protect the stator windings, direct a cooling stream of air through the motor to effectively cool the motor—add to motor life.

CAN BE RE-LUBRICATED—Original factory lubrication will last for years in normal service—but grease plugs are provided to permit re-lubrication that adds years to motor life under severe conditions.

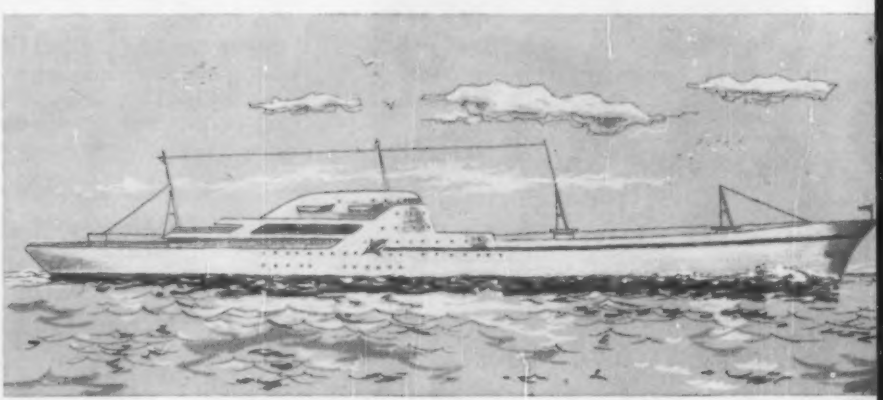


Shippingport Atomic Power Station—first United States full-scale central station atomic power plant devoted exclusively to civilian needs. First produced power on the line 12:39 A.M., December 18, 1957.



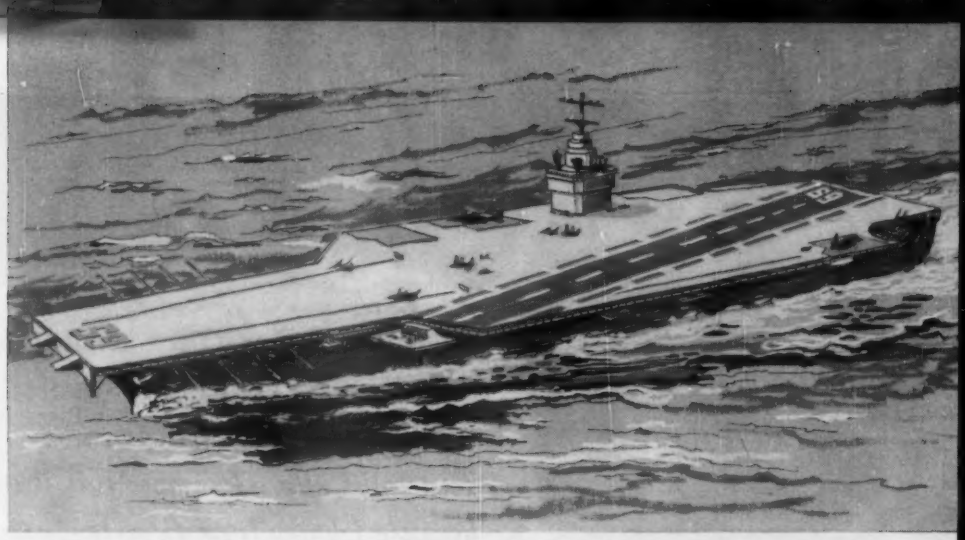
U.S.S. Skate—world's third nuclear-powered submarine. Crossed North Pole on August 11, 1958.

Next time you have a heating problem, remember...

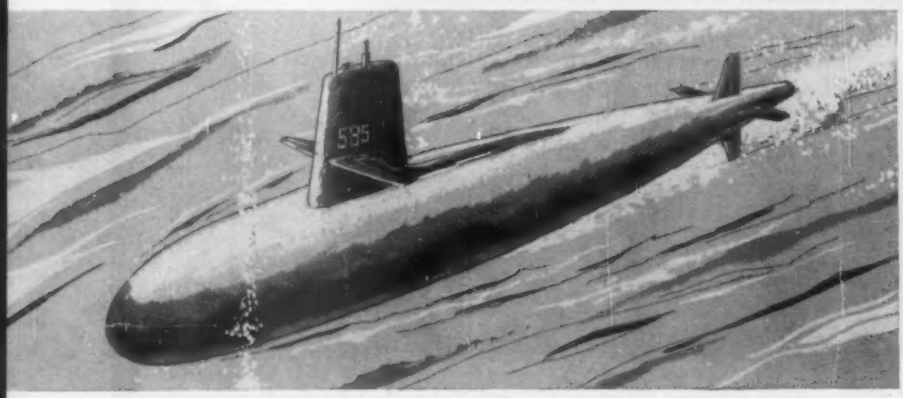


N.S. Savannah—world's first nuclear-powered merchant vessel. Launched July 21, 1959.

U.S.S. Nautilus—world's first nuclear-powered submarine. Completed first transpolar voyage August 5, 1958.



Enterprise — world's first nuclear-powered aircraft carrier. Now under construction.



U.S.S. Skipjack—world's most maneuverable submarine. Sea trials completed March 10, 1959.

CHROMALOX Electric Heat *solved* heating problems for all these projects

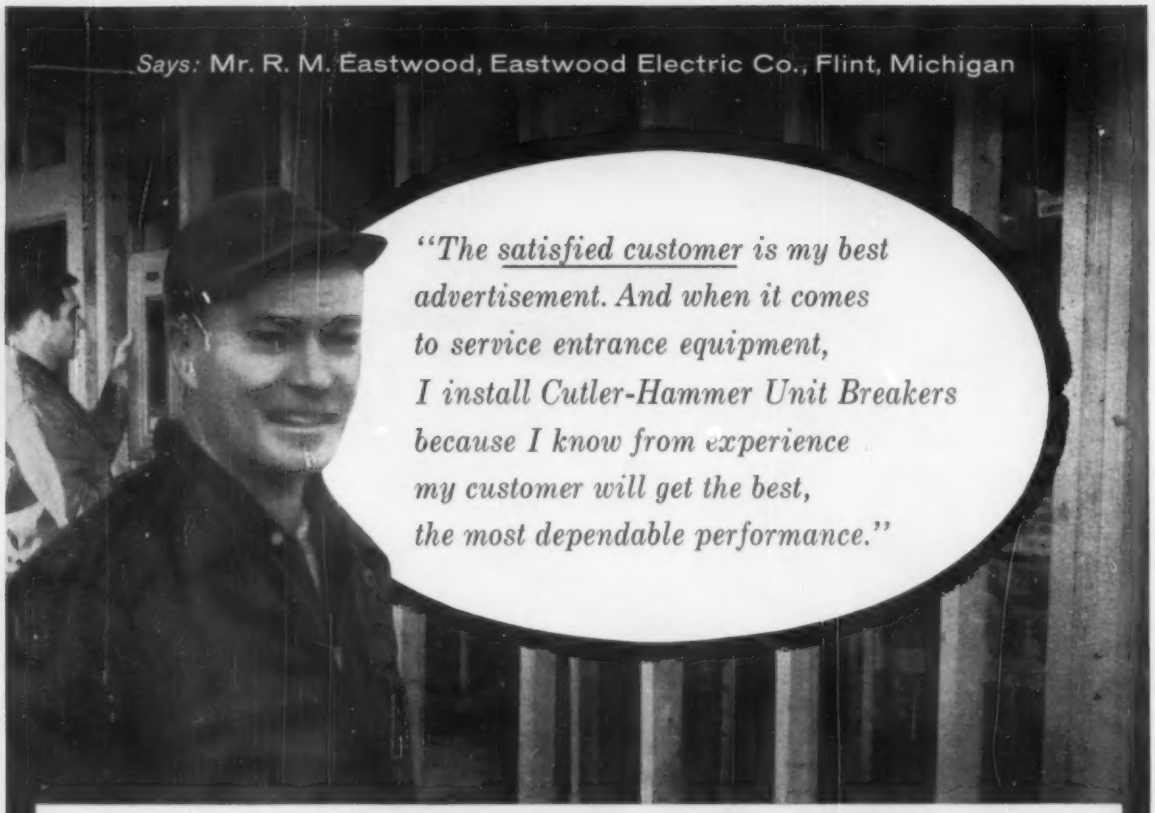
Heaters are installed in the primary systems of pressurized-water-type nuclear reactors to maintain the desired pressure control. *Each of the nuclear power projects illustrated uses hundreds of special Chromalox electric cartridge type heaters for this purpose.*

Chromalox electric heaters handle many other heating jobs in these projects. On the Nautilus, for example, fourteen different types of Chromalox heaters are used . . . for such applications as comfort heating, de-icing, maintaining lubricating oil temperatures, purifying air and water and cooking food.

Chromalox was first to make electric heating practical. Today, Chromalox has the world's most complete electric heating line, the largest stock and a nationwide network of Sales Engineering Representatives. Your Chromalox Man has the answers to *your* industrial, residential or commercial heating problems.

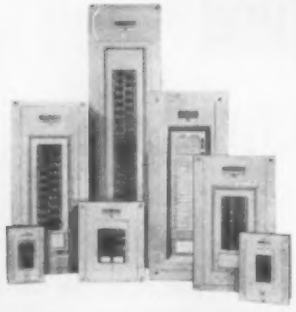
The Chromalox Library contains information on more than 15,000 different types, sizes and ratings of electric heaters and heating elements. Give us a brief outline of your problem and we will send you literature on heaters to do the job.

CHROMALOX
Electric Heat
INDUSTRIAL • COMMERCIAL • RESIDENTIAL
EDWIN L. WIEGAND COMPANY
7500 Thomas Boulevard • Pittsburgh 8, Pa.



Thousands of Contractors use C-H Unit Breakers

KNOW THE FACTS!



You won't lose profits on service complaints, you won't have unhappy customers, if you buy circuit breakers on performance, *not* on claims. That's what thousands of profit-minded contractors will tell you about C-H Unit Breakers.

C-H breaker performance pays off the same way on large as well as small jobs. Prominent housing projects across America are C-H Unit Breaker equipped, to the satisfaction of builders, contractors and home owners.

For customer satisfaction and full, steady profit, performance points to Cutler-Hammer as your choice in breakers, and 568 Authorized Cutler-Hammer Distributors will agree with you on that choice!

There's a difference . . . Are you missing it?

The "package" may look the same on good watches and not-quite-so-good ones. The same goes for circuit breakers. But the difference shouts at you when you buy on performance, *not* on looks and claims. Successful contractors—thousands of them—find that the performance of C-H Unit Breakers amounts to an extra "edge" that insures customer satisfaction and betters their business. Get that extra edge for yourself—feature C-H Unit Breakers! See your nearby Authorized Cutler-Hammer Distributor, or write for the new selection guide, *Handi-Log*, Pub. EN100-Z241. Cutler-Hammer Inc., Milwaukee 1, Wisconsin.

CUTLER-HAMMER CONTROL C-H

CUTLER-HAMMER

Cutler-Hammer Inc., Milwaukee, Wis. • *Division:* **Airborne Instruments Laboratory.** • *Subsidiary:* **Cutler-Hammer International, C. A.**

Associates: Canadian Cutler-Hammer, Ltd.; Cutler-Hammer Mexicana, S. A.; Intercontinental Electronics Corporation.

Heating Cable Warms Pig Brooding Area

ELECTRIC HEAT

Loss of a barn and livestock by a neighbor from a straw fire caused by a broken heat lamp prompted R. E. Ward, chief deputy wiring inspector for the state of Tennessee, to use concrete-embedded heating cable for pig brooding on his farm.

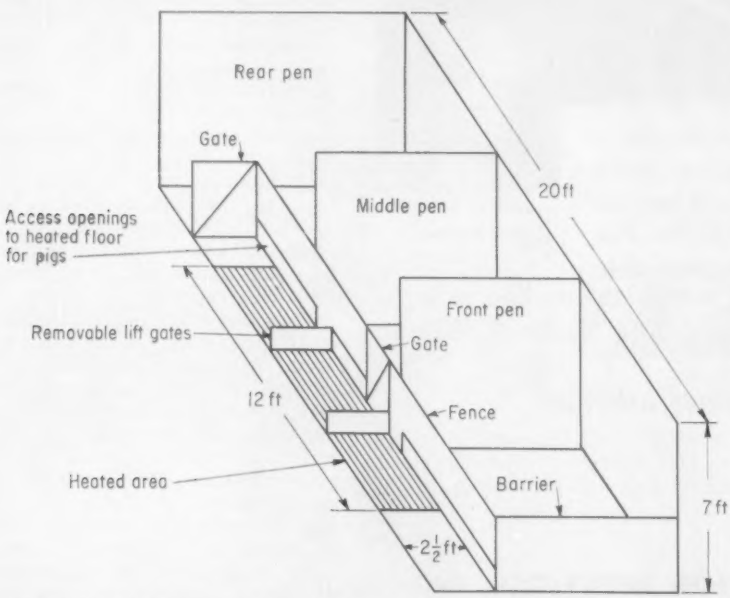
Although newborn pigs receive considerable warmth from the sow, they are often stepped on or crushed by the mother as she moves around and lies down. Heat therefore is generally provided away from the mother to draw the pigs out of danger. They find the warmth after they are only a few hours old and stay away from the sow except when feeding.

This installation consisted of approximately 218 ft of Ceilheat Ajax cable embedded 2 in. below the surface of the concrete floor of the brooder house. Rated at 120 volts, 600 watts, the cable was spaced 1¾ in. apart over an area 2½ ft wide by 12 ft long. This area proved large enough to permit the pigs to spread out over the floor rather than pile up as they have a tendency to do under heat lamps.

The concrete was poured in two layers, the first 2 in. being allowed to set overnight before the cable was run and covered with another 2 in. The house contains three pens, each with its own gate for moving the sows. The pigs move to the warmed floor through narrow openings at the bottom of the enclosing fence; the sows are too large to follow them. The heated area is divided into three sections by small wooden lift gates, one section for each pen.

The circuit feeding the brooder building originates at the main residence's service panel. Protected by a 30-amp fuse, two No. 10's are carried outside to a pole, where they are spliced to two No. 6's to minimize voltage drop along the 250-ft run to the brooder. Two No. 10's proceed from the final pole to a 20-amp fuse-switch combination in an outlet box inside the brooder building. The 3-conductor No. 12 NMC cable from this fuse feeds the heating cable, a wall-switch-controlled overhead light, and a convenience receptacle. A heavy-duty toggle switch controls the heating cable current. (Although not required by the code, heating cable used in installations such as this is often provided with additional fuse protection with a maximum current rating of 150% that of the cable.)

This cable was installed experimentally to determine its effectiveness and has worked very well. Two improvements are suggested: Another length of cable, spaced possibly 2½ or 3 in. apart inside the sows' pens would be helpful during the first few hours after birth before the pigs leave their mother. Also, thermostat control would help insure uniform floor heat and reduce supervision.



BROODING BUILDING for pigs contains strip of heated concrete to keep newborn pigs warm away from the mother. Lift gates segregate litters of the three pens; large gates permit sows to be moved. Roof, front and side wall have been omitted for clarity.

Glass-Fiber Armature Bands Improve Mill Motor Operation

METHOD

Bands built up of metallic wire such as bronze, copper and steel have for many years been used in the electrical industry to retain the components of rotating machinery against centrifugal forces. On large dc rotors such retaining bands have been generally utilized to keep the portion of the winding projecting from the rotor slots from flying outward during operation. Such bands with many improvements in banding materials, solders and banding techniques have served well for over 50 years.

In the early 1950's, however, General Electric Permafil resin was developed, which, in combination with fibrous glass, produced a material with the properties desirable for a high-strength banding tape. The resin, on curing, encases each glass thread in a steel-like grip, allowing the use of a unidirectional filament without crossthread reinforcement. In addition, this special resin imparts the properties of limpness, freedom from tack and handleability desirable for successful application to armatures.

Although the use of steel sectional bands is still practical and desirable on large, low-speed machines because of the convenience of quick removal and replacement of this type of band, glass-fiber bands have many advantages when used on armatures of metal-rolling-mill motors:

(1) More uniform distribution of temperature throughout the winding. No current can circulate in the resin-glass band, and no thick pad of insulation is needed under the band as was necessary for the metallic bands. Therefore heat may escape to the ventilating air more rapidly. Secondly, no eddy currents

GLASS-FIBER BAND shown here on large armature, binds coils tightly to prevent their flying outward due to the centrifugal force of rotation.

can develop in the glass bands, as in metallic bands, to produce self-heating.

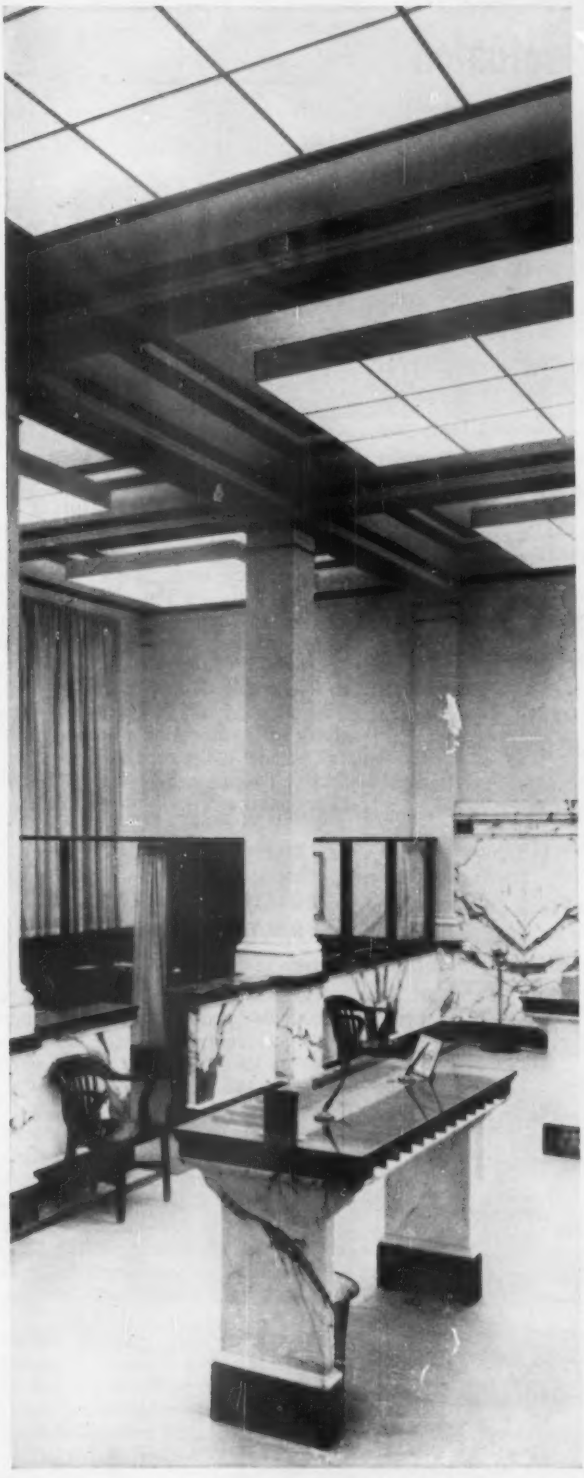
(2) Safer operation. In the event of an armature coil failure in the end winding, the glass-fiber bands have been found to suffer only slight damage but still remain intact, while the tremendous heat generated by the fault has melted solder in steel bands, causing them to be thrown from the rotor and seriously damaging other components of the machine.

(3) Ease of application. It is unnecessary to cement each turn of glass tape to its adjacent turn as it is applied or to insulate sections of the bands from adjoining sections to reduce eddy currents; therefore resin-glass bands can be applied more rapidly than metallic bands. Although no insulation is required between the resin-glass fiber band and the armature coil end windings, a thin, fully cured polyester glass laminate is placed under the band to prevent the resin in the banding tape from bonding to the glass-fiber armor tape on the armature coil, so that the band can be removed if necessary.

Since the tension of the banding must always be greater than the radial outward centrifugal force produced by rotation, it is important that the processes for applying and curing the material be done in a manner which will maintain the required tension. The bands do not shrink and become tighter on curing. The resin does shrink, but this manifests itself in becoming more tightly attached to the glass fiber and exerts no force to increase tension.

These properties assure an installation possessing greater reliability and reduced maintenance.

LPI Panelaire modernizes bank's lighting, large-area units give comfortable, high-level illumination



Panelaire luminaires provide 110 footcandles maintained illumination in the Bank of Belmont, Belmont, N. C. Modular units adapt easily to existing ceiling bays. This modernization features eleven 6' x 6' Panelaire units and three 6' x 8' units, suspended on 18-inch stems. Each unit has six 800 ma Rapid Start lamps. GENERAL CONTRACTOR — *Hand Construction Co.;* ELECTRICAL CONTRACTOR — *Belmont Electric Co.;* DISTRIBUTOR — *Electrical Distributors of Charlotte;* CONSULTING ENGINEER—*Frank Wooten and Associates.*

Now proved in hundreds of applications

The Panelaire "floating panel" luminaire was developed and first introduced by Lighting Products Inc. Since introduction, its use in hundreds of applications has proved it to be a simple, practical and efficient means of providing high-level lighting.

Fits any shape area

Panelaire's wide acceptance is due in part to its modular construction that permits unlimited freedom in architectural design. Luminaires in nine different sizes, from 2' x 4' to 6' x 8', may be ganged together, easily making areas, islands or lines of light. Floating ceilings that clear the walls eliminate costly fitting and installation. Panelaire 2-, 4-, or 6-lamp units come fully pre-assembled in individual cartons, ready to install.

High-level illumination

Panelaire provides illumination levels up to 300 footcandles. It uses Slimline lamps, high output Rapid Start lamps, or Power Groove lamps to provide high level, glare-free light for large-area applications. Panelaire is UL-listed and is available with a variety of diffusers to suit your application.

Mail coupon for complete information, technical and photometric data

LPI FLUORESCENT LIGHTING

Lighting Products Inc., Highland Park, Illinois

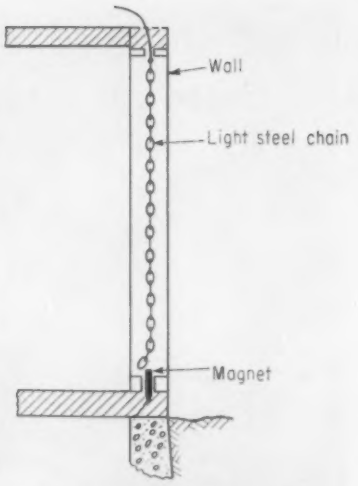
Please send latest Panelaire bulletin. ECM

Name

Firm

Address

City *Zone* *State*



Magnetic Method of Fishing in Walls

INSTALLATION

A novel method for fishing between walls is reported by M. L. Monson, superintendent of Municipal Facilities, Fosston, Minn.

As shown in the accompanying diagram, a light steel chain is used as the fish line. This chain is dropped between the wall surfaces. To "grab" this chain from below, a small magnet is used. This is a magnet of the type mechanics use to fish out nuts and pieces of iron. The magnet is inserted and the chain agitated until contact is made.

The method offers fast and effective fishing, especially where the two openings are not in line.

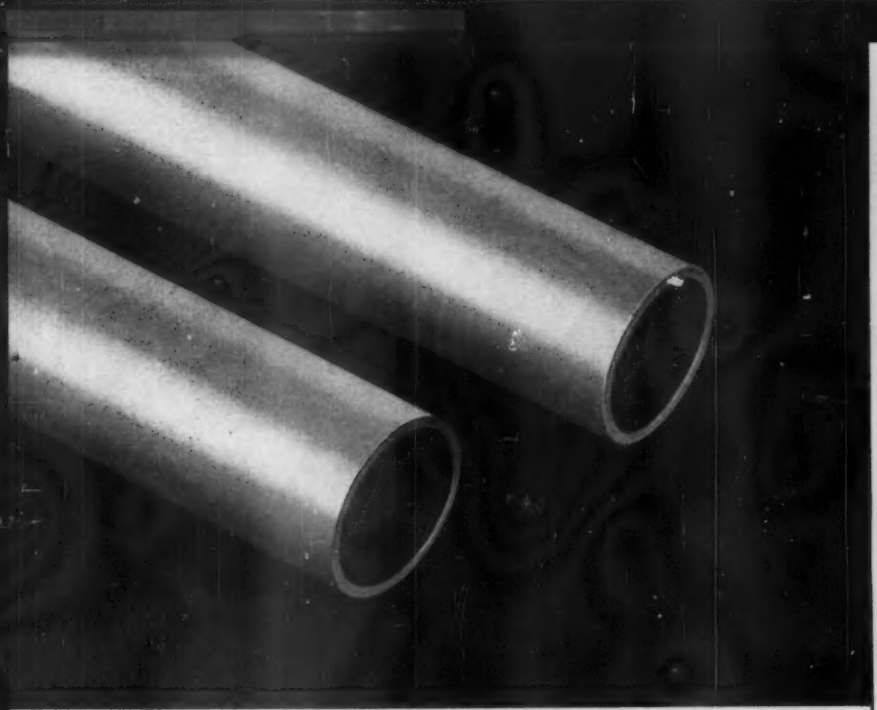
Electric Heat for Sidewalk Bank Tellers

HEATING

Electric radiant heaters have solved the problem of cold hands and uncomfortable winter temperatures in two sidewalk teller windows of the Harvard Trust Co., Cambridge, Mass.

Cold air, continuously introduced as deposits are received and as the deposit slips and bank books are returned by a sliding drawer, previously made the drawer and nearby metal parts extremely cold to the touch, resulting in chapped hands and general discomfort to the tellers.

The Chromalox radiant heater installed in each window is rated at 120 volts, 800 watts, and is bolted to a metal plate which runs horizontally across the ceiling of each of the two counter coves. The



Hard galvanized finish for durability; polished satin lustre for lasting good looks.

Even EMT can look good ...if it's CIRTUBE* EMT

TRUE, the first things you look for in EMT are: one, is it easy to work with—two, is it made to give lasting protection. CIRTUBE EMT, by the way, rates tops on both. But there's no reason why EMT can't *look* good as well!

That's where CIRTUBE EMT "shines," too. Reason for its pleasing polished satin lustre is the cyanide zinc plating process Circle uses (even though it costs a little more to apply than other methods).

The zinc bond is better, too—won't chip or flake off. That's because Circle employs elaborate cleaning processes to make sure that the steel is absolutely clean before plating.

Quality finish is only one of many reasons why CIRTUBE EMT has gained such wide acceptance in so short a time. Why not try it next time you order—you'll like it.

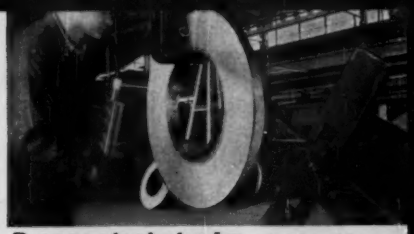
*Trade Mark

CIRCLE WIRE & CABLE
a subsidiary of
CERRO DE PASCO CORPORATION

PLANTS: Maspeth and Hicksville, N. Y. **SALES OFFICES & WAREHOUSES:** In all principal cities

RUBBER COVERED WIRES & CABLES • VARNISHED CAMBRIC CABLES • PLASTIC INSULATED CABLES
NEOPRENE SHEATHED CABLES • "CIRTUBE" EMT

CIRTUBE EMT *Ask for it!*

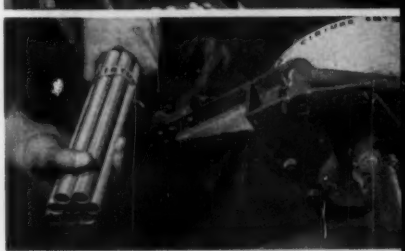


Proper steel plus! The best cold rolled steel plus the right handling give CIRTUBE EMT its natural bendability.

Easy fishing! A baked-on protective coating gives CIRTUBE EMT a built in lubrication for easier wire pulling.

Split-free, bead-free! Induction welded CIRTUBE EMT, left, proves stronger than ordinary EMT, provides easier fishing.

Automated quality control! Automatic controls assure complete and continuing uniform quality of product.



Tight, easily handled bundles! Bright, orange tapes hold CIRTUBE EMT securely for easy handling on and off the job.

Fast, friendly service! Well-known Circle service through a nation-wide network of well stocked nearby warehouses.

RADIANT HEAT is directed downward from ceiling-mounted heater to warm hands of teller as well as metal drawer and counter top. Heater output is dialed to suit teller by means of controller under drawer.

heater is wired to an input controller which permits the teller to adjust the heater's output exactly as she likes it. Radiation is downward, directly on the drawer and on a small adjacent area, matching the heat loss of the drawer and other conducting surfaces.

The radiant heater, made of extruded aluminum which blends with the stainless steel counter trim, performs in two ways. Its radiation cuts through cold drafts and thus warms the teller's hands and arms without any interference; and it heats the drawer and other metal in the immediate vicinity, eliminating conducted cold in the metal and causing the metal itself to act as a heat radiator.

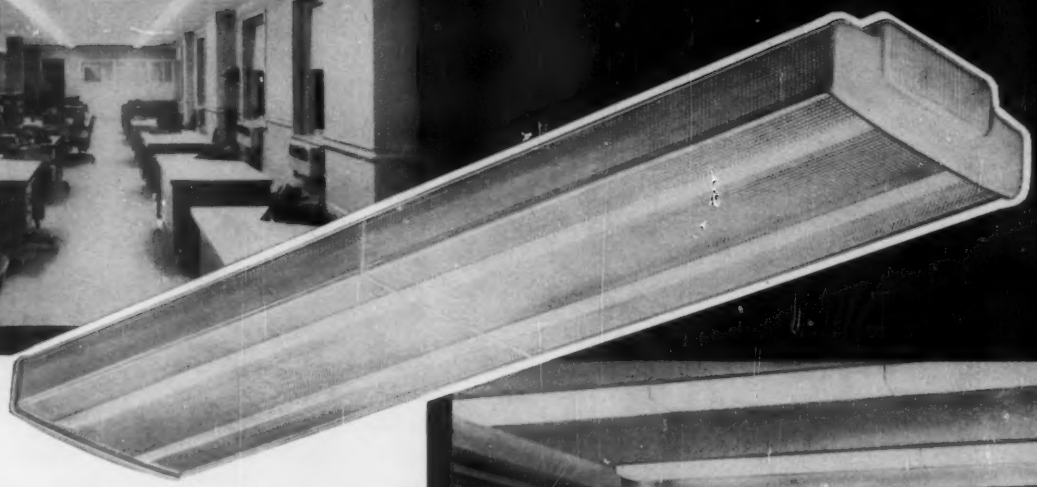
PROUDLY DISPLAYING two of his company's latest remodel jobs is Ralph McCauley, partner, Buckner Electric Motor Service Company, Kokomo, Ind. Ralph is responsible for a large share of the motor repair jobs accomplished by his company.

ETAIL STORE

OFFICE

Every Installation Proves the Lighting Quality of

HOLOPHANE REALITE®

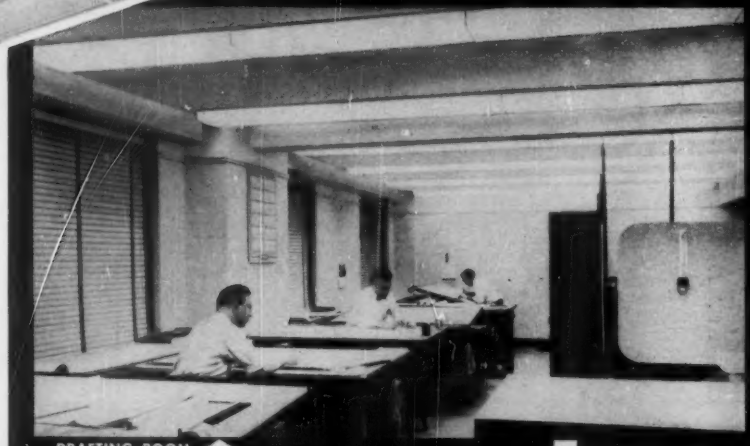


Featuring PRISMALUME®
(crystal acrylic plastic)

Maximum Light Control...
High Output...Low Brightness

Those who know lighting quality, have been unanimous in their acclaim of REALITE... Wherever it has been used—offices, stores, drafting rooms, schools, banks, showrooms—it has provided consistently effective results: high level illumination with the utmost visual comfort...The PRISMALUME enclosure is light in weight, shatter resistant, free from discoloration. Its prismatic control directs maximum lighting to the area where it is most needed...In terms of "life cost" per installation, REALITE®, assures considerable economies.

Our engineering staff invites inquiry regarding your lighting projects...



DRAFTING ROOM

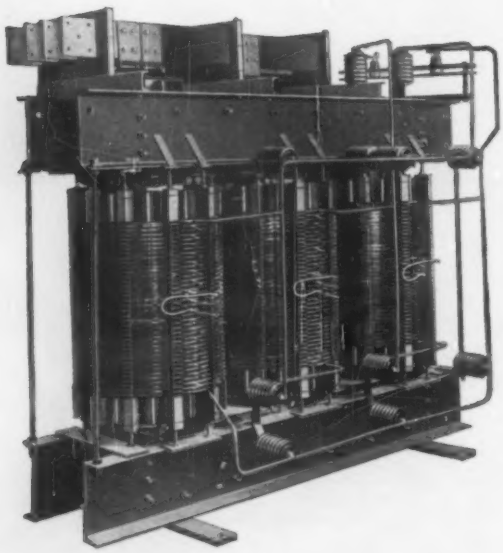
KINDERGARTEN

Holophane

HOLOPHANE COMPANY, INC.
Lighting Authorities Since 1898
342 Madison Ave., New York 17, N.Y.
THE HOLOPHANE CO., LTD., 418 KIPLING AVE., SO., TORONTO 16, ONT.

Your plant . . . building . . . equipment depend solely upon the transformer

SORGEL
SOUND-RATED DRY-TYPE
TRANSFORMERS



2000 Kva 3-phase 15 KV transformer, core and coils only. Illustrating disc type continuous windings without splices and substantial supports of all terminations.

The dry-type transformer is the heart of your entire electrical distribution system. Its continuous, reliable and economical performance is vital to every operation . . . from heavy machinery and production equipment, to the air-conditioning and light in your office.

SORGEL sound-rated dry-type transformers assure you of . . .

Time-Tested Reliability . . .

Nearly half a century's experience in the development, manufacturing and application of transformers, in world-wide use.

Installation Flexibility . . .

Place at any convenient location near the load center . . . reduce long feeder runs . . . provide greatest economy.

Lowest Sound Level . . . Highest Efficiency

Originators of low sound level. Sound-rated up to 10,000 KVA. Lowest core and copper loss, resulting in minimum operating costs.

A Complete Line . . .

¼ KVA up to 10,000 KVA. 120 volts to 15,000 volts. Also transformers for special applications and saturable reactors to regulate and control electric power.

Compare before you buy or specify. Then, select the best dry-type transformer, made only by

Sorgel Electric Company

836 West National Avenue, Milwaukee, Wis.

Sales engineers in principal cities.

Consult the classified section of your telephone directory or communicate with our factory.

THE LARGEST AND OLDEST EXCLUSIVE MANUFACTURER OF DRY-TYPE TRANSFORMERS

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ADVERTISEMENTS

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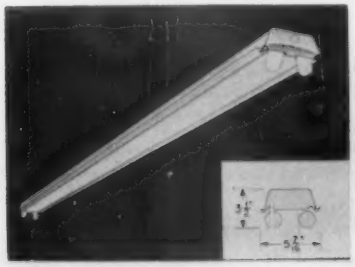
Product News

Plug-in Busway (1)

Designed with maximum safety features, the new XL Duct makes it almost impossible for an electrician to touch a live busbar. When installing a bus plug, the plug-in cover must be closed until the switch plug is in a safe position, and it cannot be attached or removed while the switch is in the "on" position. XL Duct comes in 10-ft lengths, and elbow units are available. Other features are low voltage drop, simplified joints with a minimum number of bolts, and plug-in take-offs at any place along the duct without disconnecting the power. Ratings are 225 through 1,000 amps and voltages through 600, ac, 3-wire single phase, and 4-wire 3-phase with full neutral size available. Busbars are aluminum, but copper can be obtained, if desired. Literature available.

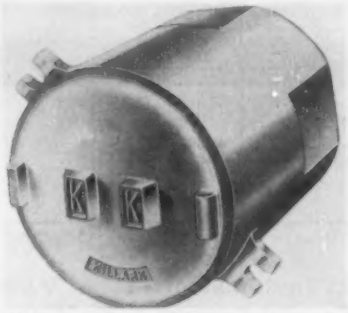
BullDog Electric Products Div., I-T-E Circuit Breaker Co., Box 177, *Detroit* 32, *Mich.*



Lighting Fixture (2)

New 2-lamp strip units, called Lite-Way, is available for 4-ft rapid-start, 8-ft tandem rapid-start and 8-ft slimline lamps. It can be transformed into a shielded fixture by the addition of the Fairview enclosure. Unit has 4- or 8-ft rigidized chassis, CBM ballast, and is fused to give safe overload protection. There are surface and suspension mounting knockouts, bushed hole snap-in inserts for through wiring at ends of channel, and outlet box access knockouts at back center.

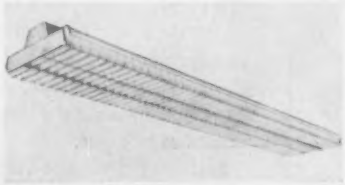
Day-Brite Lighting, Inc., 6260 *N. Broadway, St. Louis* 15, *Mo.*



Aluminum Fitting (3)

An explosion-proof fitting for concrete mounting, identified as Series GRC, is available with blank cover for use as a splice box and hub cover suitable for fixture hanging. It is made of non-rusting aluminum. Available in conduit sizes from ½ to 1 in. in a wide variety of hub styles.

Killark Electric Mfg. Co., Vandeventer and Easton Aves, St. Louis, Mo.



Fluorescent Fixture (4)

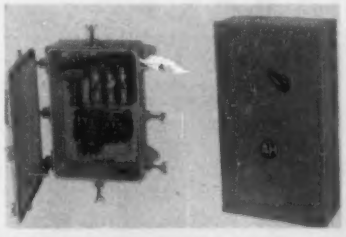
Development of a new commercial fixture utilizing the latest Power-Groove lamps for high light output has been announced. It is claimed that the new two-lamp Director unit produces 30,000 lumens which is equal to a standard six-lamp unit. Fixtures may be pendant-mounted individually or in continuous rows. Other features include steel louvers, baked white-enameled parts and simple re-lamping method. Literature available.

Smithcraft Lighting, Chelsea 50, *Mass.*

Relay (5)

A new relay, type CP, used to detect reverse phase connections of transmission lines, transformers, motors, generators or synchronous condensers. It is a 3-phase, contact-making voltmeter. One set of relay contacts closes on 3-phase overvoltage conditions and the other set closes on 3-phase undervoltage, loss of voltage, reverse phase connection or serious phase unbalance. Main contacts of relay close 30 amps at 250 volts dc and carry this current for sufficient time to trip a circuit breaker. Relay is housed in a Flexitest case.

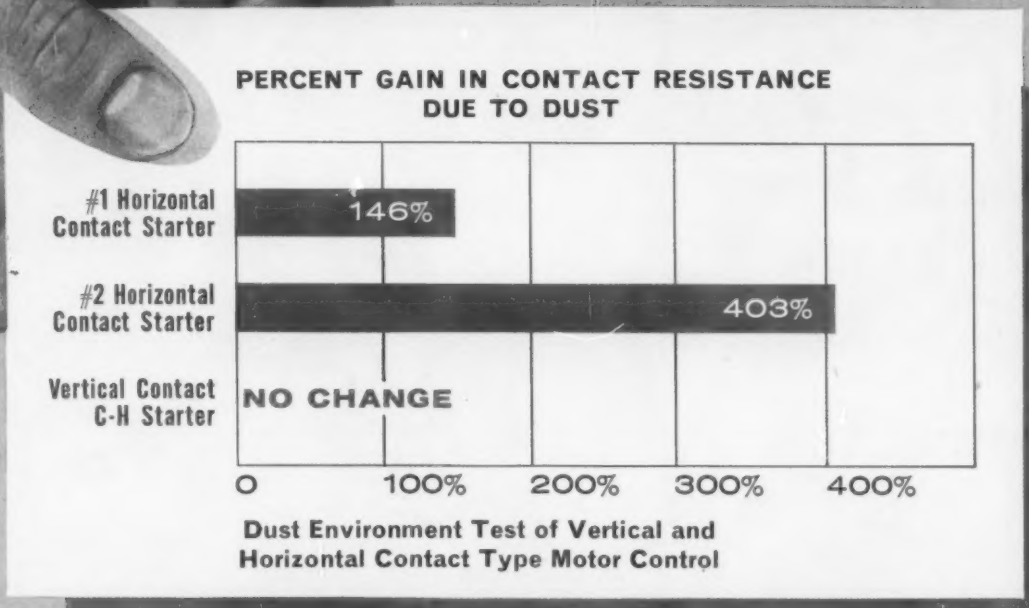
Westinghouse Electric Corp., P. O. Box 2099, *Pittsburgh* 30, *Pa.*



Combination Starters (6)

Size 3 and 4 combination starters and cast aluminum weatherproof and explosionproof enclosures have been added to a complete line of starters. New NEMA 4 weatherproof enclosures are available for combination starter sizes 0 to 4; and NEMA 7 and 9 explosionproof enclosures are available in sizes 0 to 3. Both of these enclosures are cast aluminum. Features include straight-through front wiring, wide voltage range and epoxy-resin encased coils and large long-life contacts. Units are front operated by a fused or unfused disconnect, or circuit breaker.

The Arrow-Hart & Hegeman Co., Hartford, Conn.



PROOF OF PERFORMANCE

Vertical *dust-safe* contacts keep Cutler-Hammer Three-Star Motor Control working better...working longer

Standard dust chamber used to compare performance of vertical and horizontal contact type motor starters in dust environments

"Dust can't collect on a vertical surface." This is a simple fact, but an important one to users of motor control. To function properly the contacts in motor control *must* stay clean, free from all forms of dust under all operating conditions. And because dust can't collect on a vertical surface, only vertical contacts are truly *dust-safe*. For proof look at the results of this test.

Both horizontal and vertical contact type motor starters were subjected to a dust environment for four hours. The vertical contacts proved their immunity to dust by maintaining a constant contact resistance. But the contact resistance of horizontal contacts skyrocketed, and as contact resistance increases so does heating, pitting and wear, resulting in rapid contact failure.

These are the facts . . . facts which show you why it's wise to standardize on Cutler-Hammer Three-Star Motor Control with vertical *dust-safe* contacts.

CUTLER-HAMMER

Cutler-Hammer Inc., Milwaukee, Wis. • Division: Airborne Instruments Laboratory. • Subsidiary: Cutler-Hammer International, C. A. Associates: Canadian Cutler-Hammer, Ltd.; Cutler-Hammer Mexicana, S. A.; Intercontinental Electronics Corporation.

CUTLER-HAMMER CONTROL C-H

Intercom System (7)

A new series of high power intercom equipment, designated Ektacom "S" series, features all-steel cabinets, 5 watts of power, hand wired amplifiers, high fidelity techniques. Master stations capable of selecting up to 48 other stations are available; over 24 different remote units. New "S" series can be intermixed, and stations can be private or monitor within the same systems.

Fisher Berkeley Corp., 4224 Holden St., Emeryville 8, Calif.

Outdoor Lighting Unit (8)

The new "Hylighter" is designed specifically for specialized lighting in outdoor locations. Aluminum construction is weather-resistant and impact-resistant. Available in heights ranging from 8 ft to 16 ft to fit 200-300 watt PS-30 medium base or 300-500-watt PS-35 or 40 mogul base lamps. Literature is available.

Spero Electric Corp., 20500 St. Clair Ave., Cleveland, Ohio

New Circuit Breaker (9)

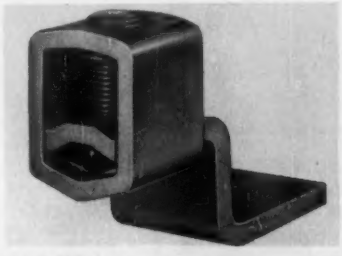
Featuring integral rotary handles, a new line of molded-case circuit breakers are offered in various frame sizes and ratings. New line includes 15- to 100-amp, 480-volt EF frame breakers, 15- to 225-amp, 600-volt F frame breakers, 70- to 400-amp, 600-volt J frame breakers, and 125- to 800-amp, 600-volt M frame breakers. Units are for use in commercial and industrial applications in switchboards, control centers, panelboards and individual enclosures. Position of the rotary handle is visible from a distance, and the mechanism has been designed to clearly indicate a center trip position. Further details available.

Federal Pacific Electric Co., 50 Paris St., Newark 1, N. J.

Post Light Control (10)

Called "Nytrol," a photoelectric unit is designed for use with standard lawn post lights, and will automatically turn lights on at dusk and off at dawn. Unit has a switching capacity of 1000 watts at 125 volts, 60-cycle ac. Additional features include operation at ambient temperatures from —40 deg. F. to plus 150 deg. F, and a sensitivity range from 1 to 10 fc.

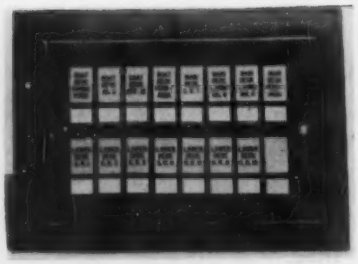
Micro Balancing, Inc., Garden City Park, L. I., N. Y.



Solderless Lugs (11)

A line of newly-designed, electrotin-plated, seamless copper solderless lugs can be used for either copper or aluminum conductors. Featured for the Series SLUH are heavy construction, high torque value, low heat rise, captive tang or tongue that cannot fall out, and V-type serrated vise jaws.

Ilsco Corporation, Cincinnati, Ohio



Lamp Annunciator (12)

A new type of lamp annunciator with rectangular lamp units and momentary contact pushbuttons are designed to supervise any devices that can be equipped with electrical contacts. Called Series "DOM," they are supplied with two sizes of rectangular lamps and pushbuttons, ¾ by ½ in., or 1 1/16 by ¾ in., and are available with or without individual reset buttons, cabinets and relays, etc. Pushbutton ratings are, type No. 1025, N.O. or N.C. 0.5 amp at 250-volt ac, and No. 1126, 0.2 amp, 250-volt ac with two sets normally open, or two sets normally closed, or one set open and one set closed.

H. R. Kirkland Company, 800 *King St., Morristown, N. J.*

Arrester (13)

A new arrester guards household appliances and electrical equipment against excessive voltages due to lightning. It is particularly suitable for farms, suburban and other open areas. The 120/240-volt unit requires no maintenance. Unit's non-rusting aluminum hardware can be attached to the side of a house or hung from conduit adjacent to the service lines. Special pellets in the new arrester act like an automatic valve. When excess voltage, generally caused by lightning, occurs in the line, the automatic valve opens for a few millionths of a second allowing potentially dangerous surges to ground.

General Electric Co., Schenectady 5, *N. Y.*

Threading Dies (14)

A new line of threading dies designed specifically for aluminum conduit. They have been especially engineered and developed with cutting teeth particularly shaped and angled to accommodate the requirements involved in aluminum threading. They are available in a range of sizes, ½ in. through 4 in.

Nye Tool Company, 4120 *Fullerton Ave., Chicago* 32, *N. Y.*

Floodlight (15)

A new line of vapor-proof floodlights, called the "Industrialites." Aluminum socket hood fits under reflector neck. A special "Clamp-Lok" gasket design provides a permanent, weatherproof seal at point of juncture while the "J Bolt" design assures a vapor-tight seal between cover and reflector. Available with etched or specular "Alzak" reflectors, stippled or plain heat and impact resisting covers and for incandescent or mercury vapor lamps.

Appleton Electric Company, 1701 Wellington Ave., Chicago 13, Ill.

Fluorescent Fixture (16)

Announcement of the new 4-ft "Prismatic-100," four 40-watts-RS economy unit has been made. This model is a companion to the two-lamp "Prismatic-50." New unit features include clear panoramic lens and white-enameled steel parts. To provide 100 fc, the manufacturer recommends the installation of one Prismatic-100 for each 40 sq ft. Catalog No. R-414 available.

The Wakefield Co., Vermilion, Ohio

Meter Socket (17)

Recent listing by UL of a complete line of meter enclosures has been announced. Enclosures are rectangle in design and are available for indoor and outdoor locations. Single units come in ratings up to 200 amps. Gang-type mountings can be furnished. These socket meter mountings have a unique feature in that a split cover permits the power company to remove the seal and lower the bottom section of the enclosure. This permits testing the meter without disconnecting the customer's service. Folder available.

Code Equipment Sales Co., 222 Kalos St., Philadelphia 28, Pa.

Welder (18)

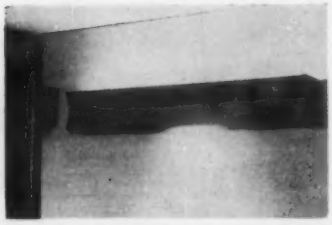
A new, lightweight, hand portable, 205-amp, heavy duty welder suitable for production welding or tacking. The Portarc 205 is especially designed for all industrial and commercial applications that require manual welding and has a full 60% duty cycle plus an 80 open circuit voltage from six conveniently located, 135-through 205-amp, heat taps. A low open circuit voltage feature is optional on the 230- or 460-volt models.

Emerson Electric Mfg. Co., 8100 Florissant Ave., St. Louis 36, Mo.

Tri-Voltage Busway (19)

Designed for the requirements of industrial laboratories, a new plug-in busway offers unique arrangements of busbars for distribution of up to three separate voltage systems. EPI Uni-bus low impedance duct is called type PH and is available in 100 and 225-amp ratings. Duct can handle applications where dc, 60-cycle ac, and 400-cycle ac isolated voltage services are required. A maximum of 15 insulated busbars can be mounted in the duct which has a cross-sectional size of 11½ by 7½ in. Various plug-in devices have breakers up to 100-amp rating or combinations of 15 to 100-amp breakers and receptacle outlets. Plug-in locations are available at 2-ft intervals on the busway. Busway lengths are 6 and 10 ft.

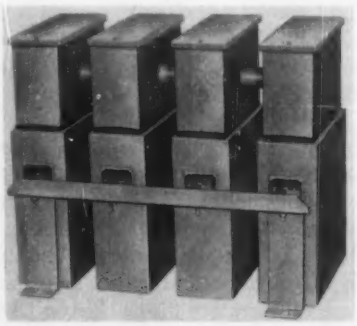
Mullenbach Electric Co., Los Angeles, Calif.



Lighting Fixture (20)

A new type, UL approved fixture that combines indirect fluorescent and controlled incandescent lighting into a single unit is specially designed for institutional lighting. Unit has particular application for over-bed lighting in hospitals, hotels and motels. Unit has been designed for end-to-end installation in series of two, three or more. Both light sources are controlled separately, making it possible for either or both of the lighting methods to function at any one time. Individual units are 4 ft in length and are suspended from any type wall construction.

Prescolite Manufacturing Corp., Berkeley, Calif.



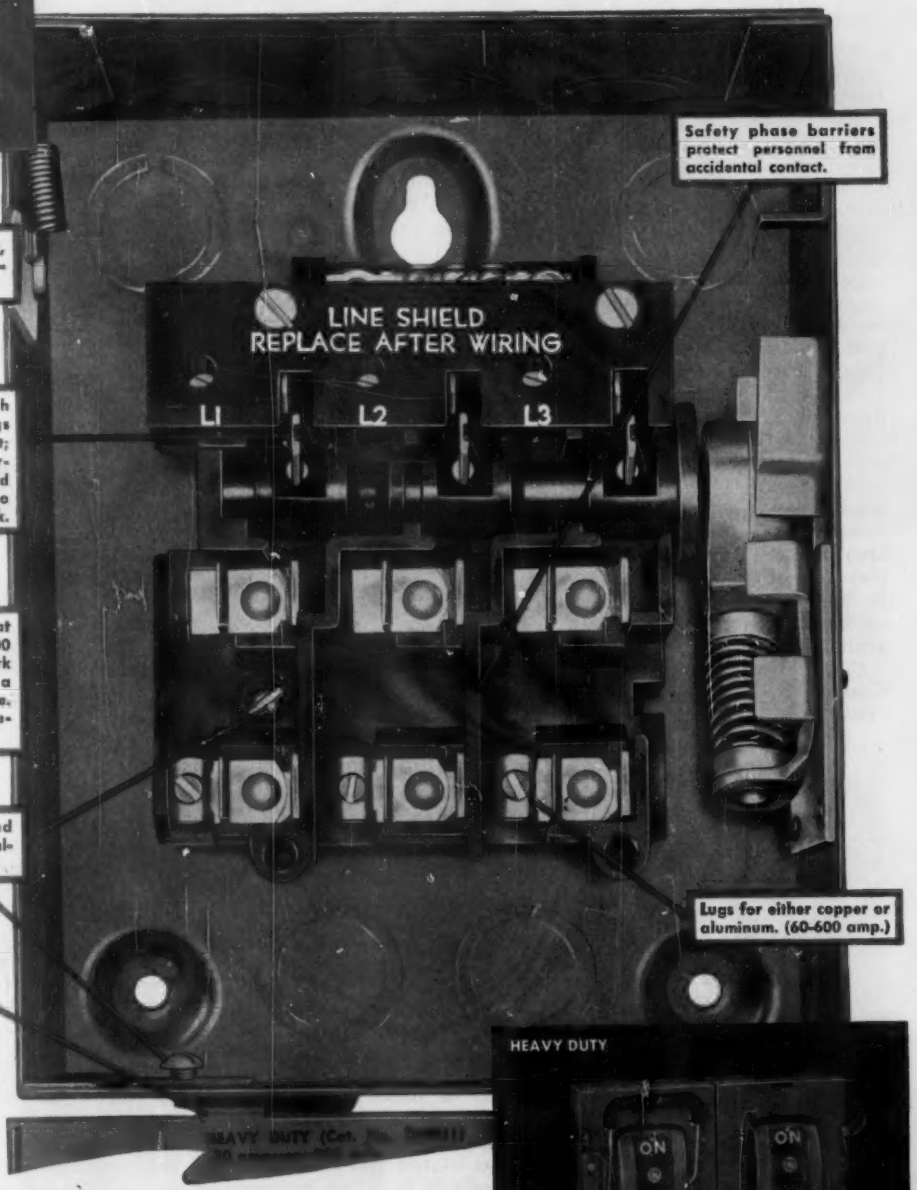
Capacitors (21)

A new series of 20-kvar power factor correction capacitors for low-voltage industrial applications, known as Type PF standard and PFD dustproof series. They are furnished for both single and 3-phase applications at 480 and 600 volts, 60 cycle. All capacitors are impregnated with Clorinol, a nonflammable askarel synthetic liquid dielectric. A special feature of Type PFD series is the incorporation of current-limiting fuses as standard equipment with the capacitor. Fuses will interrupt 100,000 amps and are equipped with set screw connectors. A complete series of single, dual, triple, and quadruple brackets for floor, wall, or ceiling mounting is also available. Bulletin PF-1200 is available.

Sprague Electric Company, North Adams, Mass.

General Electric brings you bold new advances in safety switch design

New G-E light and heavy duty safety switches offer savings in space, easier installation, longer life and maximum safety. And the Heavy Duty (Type A) sells at Normal Duty (Type C) prices! Write for Bulletin CPD-74. General Electric Company, Circuit Protective Devices Dept., Plainville, Conn.



Safety phase barriers protect personnel from accidental contact.

Clear ON-OFF indication, permanent metal nameplate.

Visible blades with stainless steel springs assure positive contact; minimum joints in current path; silver-plated current-carrying parts; no fiber linkages to break.

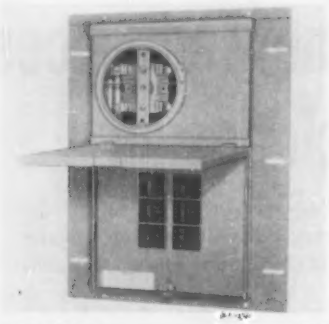
Wire incoming lines at top or bottom. (100-600 amp.) Saves time, work and wire; lets you do a neater job in less time. ON-OFF indication remains unchanged.

Removable cover and interior for easier installation.

Bottom-hinged and front-operated for close ganging.

Lugs for either copper or aluminum. (60-600 amp.)

GENERAL ELECTRIC



Load Center (22)

A new 100-amp meter socket-load center designed to meet the growing need for an outdoor service entrance device with 2-pole branches for major appliance and air conditioner disconnects plus a subfeed main to a lighting and outlet circuit panel inside the home. The new UL listed load center has capacity for up to six 2-pole circuits, one of which may be used to control a smaller lighting and appliance panel installed within the house. Wired with 2-pole G-E Type TQL circuit breakers, the unit meets NEC requirements for service entrance equipment. Ratings are 120/240 volts ac, single-phase, 3-wire. Features include lugs suitable for use with either copper or aluminum conductors; main neutral lug in meter compartment; removable front and dead front shield; silver-plated bussing. Device is available in both raintight and semi-flush enclosures. Catalog GEC-1100A is available.

Circuit Protective Devices Dept., General Electric Co., Plainville, Conn.

Time Recorder (23)

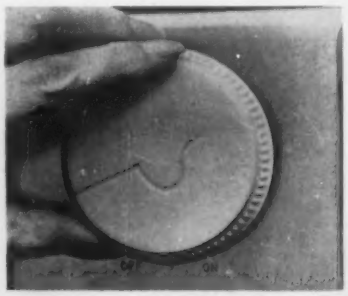
A new automatic imprint 'in' and 'out' time recorder is designed for employees with small payrolls. Model 114 unit can accommodate a varying number of employees on irregular work schedules, printing accurate records on conventional time cards. Type wheels are geared together for synchronism at all times. Vertical file time card racks and standard size time cards that accommodate weekly, bi-weekly or semi-monthly payroll periods are also available.

Stromberg Time Corp., 135 So. Main St., Thomaston, Conn.

Epoxy Compound (24)

A new epoxy butter compound is now available for protecting electric motor stator windings against moisture, dirt, abrasives, chemicals and other contaminants. Hysol 10-55 is a two-component system which is mixed one to one by volume. Its thixotropic characteristic allows the use of a simple "butter technique" in its application, even on hot stators.

Houghton Laboratories, Olean, N. Y.



Dimmer (25)

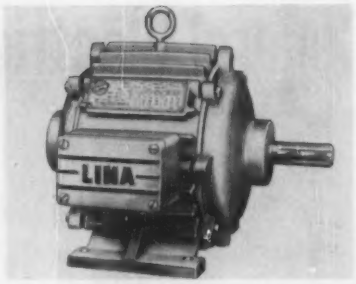
Designed to brighten, dim or blend lighting for loads of not more than 200 watts for incandescent lights or five rapid-start fluorescent lamps, a smaller Luxtrol Light Control, Model WBD200, measures 5 in. square. Other Luxtrol units are available at 450, 800 and 1800 watts. All units fit into a standard 4-in. wall. Smaller unit was developed for applications requiring only control of a few lights.

The Superior Electric Co., Bristol, Conn.

Clutch (26)

A water-cooled Magneclutch, a magnetic partical clutch which can also be used for braking, is designed for applications requiring a high degree of slippage, as in tension control and cycling. Clutch is available in either bored-motor or hollow rotor style, in eight models from 10 to 200 lb-ft rated torque.

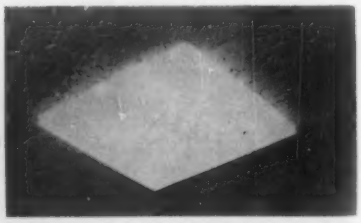
Vickers Incorporated, Electric Products Division, 1815 Locust St., St. Louis 3, Mo.



Fan-Duty Motors (27)

Type EFD fan duty motors, in rerated NEMA frame sizes 182 through 326U, are available from ½ to 15 hp at speeds of 1800, 1200 or 900 rpm. Duty rating is continuous, and temperature rise is rated at 55 deg. C. Construction features include external cooling fins, cast iron frames with integral feet, dynamically-balanced die cast rotors, and double width prelubricated sealed-ball bearings. Type EFD motors are available for 2 or 3-phase operation in standard frequencies and voltages below 600 volts.

The Lima Electric Motor Co., Inc., Dept. 71, Lima, Ohio

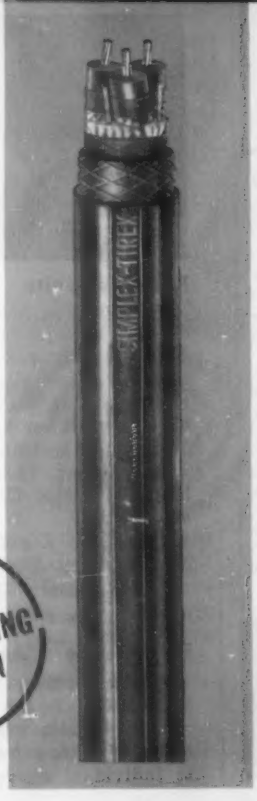


Frameless Recessed Fixture (28)

A new line of recessed incandescent lighting units feature a new type frameless design which is made possible by the use of a recently-developed diffuser made of high thermal-resistant plastic material. This new diffusing material, called "ALKCOrylic", withstands rated lamp heat without warping, distorting its shape, or discoloring according to the announcement. Features of the new "Space-Lite" fixtures are the elimination of rust or corrosion because of the absence of a metal frame or trim, more light because there is no frame or trim, and simplified diffuser fasteners. Fixtures are available with flanged housings for 8¾ in. sq and 12 in. sq ceiling openings. A tile replacement fixture is also offered, which replaces a standard 12 in. by 12 in. ceiling tile without overlapping on adjacent tiles. Bulletin is available.

Alkco Mfg., Co., 4226 N. Lincoln Ave, Chicago 18, Ill.

THE CABLE THAT LASTS LONGER... LASTS LONGER



BALANCED COMPOUNDING CURED IN LEAD

This headline is not meant to confuse you, but to point out that in spite of all of the claims you may hear about portable cable life, based on accelerated aging tests, true proof, as always, consists of *performance!*

The Tirex cable shown in the above illustration has been in service for more than fifteen years. During this time it has been dragged over rocks and sand. It has been flexed, stretched, immersed in oil and water; and crushed under the wheels of trucks and carts.

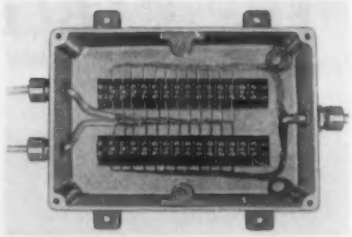
The fact that it has successfully resisted these abuses and is *still* operating is a tribute to the *Balanced Compounding* and *Cured-in-Lead* construction of its jacket.

Balanced Compounding and *Cured-in-Lead* construction assure you of maximum resistance to all of the factors which affect cable life. And there is no undue emphasis on any one factor at the expense of the others.

The record of performance achieved by Tirex Cables in installations all over the world is *proof* of the correctness of Simplex *Balanced Compounding*.

For complete information on Simplex Tirex Cables and Cords, get in touch with your nearest Simplex Distributor, or write directly to

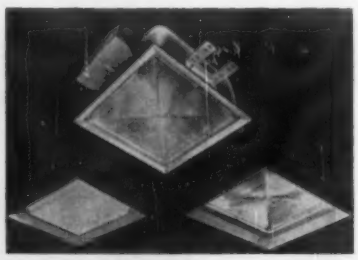
Simplex
WIRE & CABLE COMPANY
79 Sidney Street, Cambridge, Massachusetts



Terminal Boxes (29)

A new line of weatherproof multi-junction thermocouple terminal boxes built of cast iron or sheet steel, with neoprene gasketed covers. Various models and sizes will provide protected termination of from 60 to 100 thermocouple circuits, wherever dusty, oily, humid, corrosive or other contaminating environments might affect thermocouple accuracy. Boxes were designed, primarily, for use with "Thermo-Cable," but will find a wide use in other wire termination applications. Cast iron boxes have either hinged or screw-down type covers, threaded openings for fittings, and external lugs for surface mounting. Sizes range from 8- by 8-in. by 4-in. to 20- by 24- by 8-in.

Thermo Electric Co., Inc., Saddle Brook, N. J.



Recessed Units (30)

A new line of recessed incandescent lens boxes called Uni-Frame. They can be fitted with either lens or glass bowl, frames and splays to make a total of 24 basic appearance combinations. The 10-in. unit accommodates 100-150-watt lamps; 12-in. 200-300-watt lamps. Bulletin OD-1036 is available.

Day-Brite Lighting, Inc., 6260 *N. Broadway, St. Louis* 15, *Mo.*

Portable Cord Assembly (31)

A new cord assembly contains a 50-ft 3-wire No. 10 cord which terminates into a molded tap device from which three separate cords run to individual molded 3-pole recep-

tacles. A 15-in. connecting cord is provided for connection into the temporary power source, and the extension plugs into this. System was designed for use on construction jobs where durability and flexibility are desired. The No. 10 wire used in the cord reduces voltage drop to electrical tools, and the grounding conductor and 3-pole plug connection provide a safe method of grounding portable equipment. Cord kit is listed by UL.

Tuffline Division, Whitley Blake Co., New Haven 14, Conn.

Ballast **(32)**

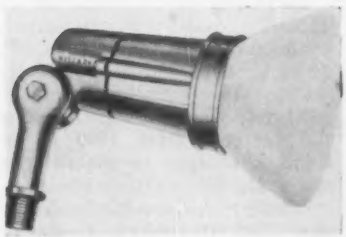
A new ballast that delivers rated lamp current and provides maximum germicidal effectiveness for application in evaporative coolers and room air conditioners is designated 6G3551. It is designed specifically for one G25T8 lamp to operate at 118 volts, 60 cycles, at 600 ma. Ballast has been approved by UL.

General Electric Co., Schenectady 5, N. Y.

Weatherproof Switch **(33)**

"Insulprene" plates are designed to protect "Pressswitch" ac switches from the weather. Center of the cover plate contains a sealed neoprene raised hub, and the press switch is operated by pressing the hub. There are no covers to lift or caps to pull off or unscrew. Plate fits standard or FS boxes. Ratings are 120-277 volts, 15 or 20 amps; SP, DP, 3-way and 4-way.

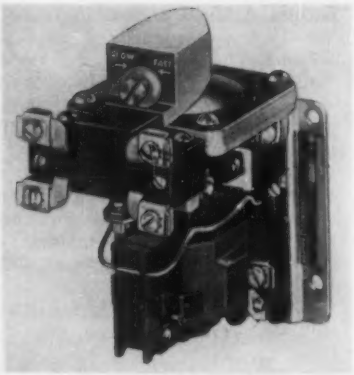
Harvey Hubbell Inc., Bridgeport, Conn.



Cluster Lights **(34)**

A new, easy-to-install line of PAR-38 and R-40 lampholders have been added to this line. They are made of die cast aluminum and each has its own built-in splice chamber, designed for accessibility. Descriptive data are available.

Killark Electric Mfg. Co., Vandeventer and Easton Aves., St. Louis, Mo.



Timer **(35)**

An internally ported air system is incorporated in a new pneumatic timer to make it well suited for applications in dusty or dirty atmospheres. Since no external air is used, foreign matter can't get into the system to interfere with timing accuracy. Timer has a timing range which is adjustable from .2 second to 1 minute. It is available for both ac and dc operation. Bulletin 9050-9 is available.

Square D Company, 4041 N. Richards St., Milwaukee 12, Wis.

Pullout Switch **(36)**

A new 3-phase pullout switch designed and constructed to control 3-phase circuits, 3-phase motors, air conditioners, heat pumps, etc. Approved by UL, it is available in both 30 and 60 amps, and in both indoor and raintight enclosures. Data Bulletin No. 139 is available.

General Switch Company, 45 Roebling St., Brooklyn 11, N. Y.

Clamp Ammeters **(37)**

Four new clamp ammeters have enlarged jaws that will encircle conductors up to 4½ in. and buses up to 2¼ by 4 in. Three of the meters will measure currents from 50 to 2000 amps while the fourth will handle currents from 1000 to 4000 amps. Accuracy to within 3% is claimed.

Western Electro-Mechanical Co. Inc., 300 Broadway, Oakland 7, Calif.

Pull Boxes **(38)**

A new improved line of screw cover pull boxes, available in two types—"FC" for flush installations and "SC" for surface mounting. Basic difference in the two types is that the covers for "SC" boxes conform with the outer dimensions

of the box while covers for "FC" overlap the outer dimensions by 1 in. on all four sides. Available in a wide range of standard sizes from 4- by 4- by 4-in. to 24- by 24- by 6-in.

Keystone Manufacturing Co., 23328 Sherwood Rd., Warren, Mich.

Weatherproof Outlets (39)

"Duo-Lok" caps are featured with grounding-type weatherproof duplex receptacles or switch-receptacle assemblies. Recessed Duo-Lok snap-cap locks in an open or closed position, providing extra protection for cords. Units come in a complete package form for display or shelf storage. Information available.

Perfect-Line Mfg. Corp., Old Country Rd. and RR Ave., Hicksville, L. I., N. Y.

Pole Base Outlet (40)

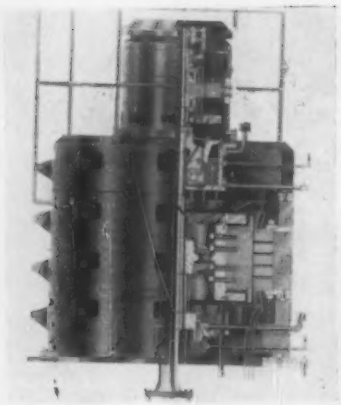
Announcement has been made of a new metal pipe base with an integral junction chamber which is accessible through the front cover. Weatherproof outlets for 110- or 208-volt receptacles can be furnished in the pole base. Top of the unit has threaded hubs, available in sizes to receive 2-, 2½-, 3-, and 4-in. threaded pipe for outdoor lighting fixtures.

Hope Electrical Products Co., 39 Long Ave., Hillside, N. J.

Lampholder (41)

A newly designed M-430 lampholder for outdoor use. Features are: die-cast aluminum construction and adjustable swivel arm, serrated, calibrated locking swivel teeth; silicon rubber weather-seal and porcelain glazed sockets with spring loaded contact tab. All socket metal parts are copper nickel plated and entire unit is finished in outdoor Weatherbrite aluminum paint. Literature is available.

Moldcast Manufacturing Co., 236 South St., Newark 5, N. J.



Vertical Motor (42)

New high speed wound-rotor vertical motors with a wide range of enclosures are offered at 150 hp and up, and with frames 584 and larger. Motors are designed for applications requiring high starting and accelerating torques with low inrush current, or adjustable speed control. Other features include a slip ring assembly which can be removed as a unit for servicing, and a large-volume, low-velocity air circulation. Insulations are types A, B and H, and can be obtained with a number of special materials.

The Ideal Electric and Mfg. Co., Mansfield 28, Ohio.

Control Stand (43)

Designed for industrial use, this control stand consists of a pedestal mount and any one of 11 sheet metal boxes for oil tight pushbuttons. Pedestal is 42 in. high. The 4- by 4-in. sq column rests on a heavy base which may be bolted to the floor. Sheet steel, oil tight pushbutton enclosures accommodating from one to 25 oil tight buttons are available for use with the pedestal mount. Enclosures are completely gasketed and have "universal" holes which will receive all standard makes of oil tight pushbuttons. They are 4¾ in. deep. Wiring connections for pushbuttons may be made through base of stand, to vertical column, or directly to pushbutton box.

Hoffman Engineering Corp., Anoka, Minn.

Vaportight Fixtures (44)

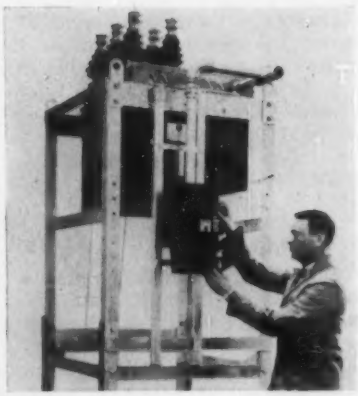
Surface-mounted series of enclosed and gasketed fixtures are designed for outdoor installations and indoor applications where corrosive elements are present. Underwriters' listed for use with up to two 100-watt incandescent lamps, the fixtures incorporate a 4-in. cast-aluminum junction box, gasket and screws for vaportight seal at conduit entry. Cast aluminum finishing collars and protective guards can be obtained for the 43-88 fixture line.

McPhilben Lighting, Inc., 1329 Willoughby Ave., Brooklyn 37, N. Y.

Trencher (45)

New 12 hp model M-322 Ditch Witch cuts trenches to 5 ft deep and 12 in. wide. Unit is powered by a Wisconsin AGN 12 hp, air cooled engine and equipped to dig ditches 5 ft deep, 4 in. wide; 4 ft deep, 6 in. wide; 3½ ft deep, 8 in. wide; 3 ft deep, 10 and 12 in. wide, in any soil.

Witch Marketing Company, 1959 West Fir Ave., Perry, Okla.



Substation Frame (46)

A new substation frame for the type PR recloser is available. Recloser height is easily adjusted over a wide range. A movable upper section, which slides into the fixed lower section, permits selection of any height between 83 and 113 in., floor to bushing tip. Tank lifter, which utilizes a geared windlass, can be changed from one unit to another by removing two bolts. Base dimensions have been increased to reduce forces on anchor bolts.

Westinghouse Electric Corp., P. O. Box 2099, Pittsburgh 30, Pa.

Time Switch (47)

New, miniaturized 24-hour time switches designed for exposed mounting in store interiors and other locations that prohibit the use of industrial type cases. The 100 Series timers provide one "On" and one "Off" operation each 24 hours with a minimum of two hours between tripper settings. A manual tripping lever is also provided. Mounting plate is designed to fit over a standard box. Model 101-0 is rated at 120 volts, 60 cycle, SPST, 15-amp non-ind., 1600 watts, 1 hp and Model 101-3 is 240 volts, 60 cycle, SPST, 6.5-amp non ind., 1600 watts, 1 hp. Both are UL and CSA listed.

Paragon Electric Co., Two Rivers, Wis.

KRALOY...

FIRST PVC RIGID CONDUIT INSPECTED AND PASSED BY UNDERWRITERS LABORATORIES!

Only KRALOY, yes *only* KRALOY, among all plastic conduits, now carries U-L listing — another first for KRALOY! High impact KRALOY PVC (Polyvinyl Chloride) RIGID CONDUIT... the *lifetime* conduit... the *perfect* conduit... won't rust, won't pit, won't corrode, won't support combustion, is non-magnetic and non-sparking. KRALOY needs no paint, no coating, needs no lining, and its mirror-smooth inside wall makes fishing easier than with any other type of conduit. Add these outstanding features to KRALOY's extreme light weight (see chart below) and you have the *ideal* conduit... ideal for direct burial and slab work. Installation costs can be cut *drastically* with light weight KRALOY PVC RIGID CONDUIT. Consider the dollars to be saved in handling and installing U-L listed KRALOY CONDUIT Cat. No. KE-1058 versus steel, *versus even aluminum conduit:*

KRALOY PVC CONDUIT is sold only through wholesale electrical supply houses.

NOTE WEIGHT COMPARISON — KRALOY PVC vs. ALUMINUM vs. STEEL CONDUIT

U.L. required minimum weight per 100 ft. including couplings, lbs.

K-59-29

Trade Size	½"	¾"	1"	1¼"	1½"	2"	2½"	3"	3½"	4"	5"	6"
KRALOY PVC	15.0	20.0	29.0	40.0	47.0	63.0	101.0	131.0	159.0	187.0	253.0	326.0
ALUMINUM	27.4	36.4	53.0	69.6	86.2	115.7	182.5	238.9	287.7	340.0	465.4	612.9
STEEL	79.0	105.0	153.0	201.0	249.0	334.0	527.0	690.0	831.0	982.0	1334.0	1771.0

For complete information on KRALOY PVC CONDUIT and installation directions, mail the coupon or write to Kraloy Plastic Pipe Co., Inc., 4720 East Washington Blvd., Dept. ECM-12, Los Angeles 22, Calif.

NO CONDUIT REPLACES **KRALOY**

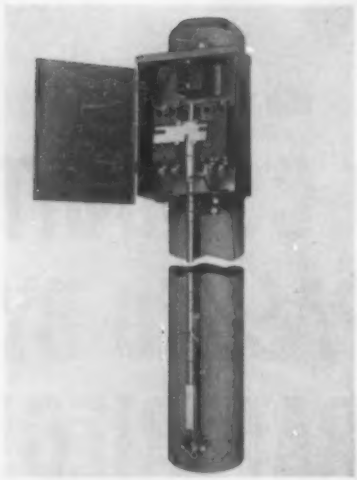
Kraloy Plastic Pipe Co., Inc., Dept. ECM-12,
4720 East Washington Blvd., Los Angeles 22, Calif.

Gentlemen: Please send me your new Brochure on KRALOY PVC CONDUIT which gives complete information and installation directions.

Name_____

Address_____

City_____ Zone_____ State_____



Split Breaker **(48)**

Cabinets are available which contain a current transformer and a new Hi-Liner Series PTB-220 Split Breaker for pole top metering and control. Designed to eliminate the need for meter-loops, the split breaker eliminates the cost of heavy meter loops down the pole. By splitting the 200-amp unit into two separate 100-amp services, the circuit will coordinate with the smaller CT already in use. Meter loops require only four No. 12 or 14 conductors from the cabinet down the pole to the meter. Mechanical handle extends from the cabinet down the pole and controls the two breakers simultaneously. Two pole "E" frame breakers are available in 15, 20, 30, 40, 50, 70, 90, and 100 amps.

Hi Products, Inc., 7700 Wentworth Ave. So., Minneapolis, Minn.

Circuit Breaker **(49)**

New magnetic DP circuit breakers have a special Companion-Trip feature. Breaker poles are in separate compartments, and are operated by a single external handle, manually or in case an overload occurs on either pole. Rated at 120/240-volts ac, the SE33 breakers have an interrupting capacity of 10,000 amps, and are available in amp ratings of 125, 150, 175 and 200. A hydraulic timing element in the solenoid coil provides for inrush current surges and overloads.

Heinemann Electric Co., 352 Plum St., Trenton, N. J.

Lighting Standards **(50)**

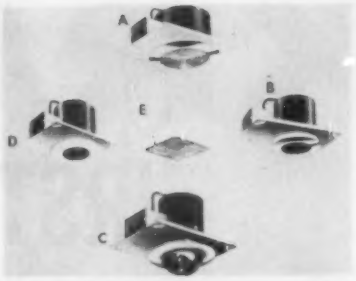
New 8 and 10-ft Octa-Tube lighting standards, styled like Millerbernd street and highway models, are now available for walk, street and driveway lighting in all types of occupancies. Standards have a tapered design, and contain a receptacle in the base. Standard luminaires can be attached to the unit. A unique feature includes a separate fuse compartment where fuses protect the receptacle and luminaire individually.

Millerbernd Mfg. Co., Winsted, Minn.

Reflectors **(51)**

A new series of medium and high mounting reflectors for RLM specifications 4A, 4B and 4C. Diameters are 16 and 18 in. and accommodate a variety of lamp sizes. Combinations of reflectors and hoods provide medium and high mounting units for 400-watt mercury and incandescent lamps from 300 to 1500 watts. They are all-white porcelain enamelled and incorporate top ventilation with a protective aluminum drip shield. Available with threaded socket or Quad Easy-Tach construction for pendant or box type mounting. Literature is available.

Quadrangle Manufacturing Co., 32 S. Peoria St., Chicago 7, Ill.



Recessed Fixtures **(52)**

Twelve new and redesigned units are additions to a line of recessed fixtures for 1960. Fixtures are of the prewired type, require no framing, and are adaptable for commercial and residential use. Fixtures are offered in a wide variety of shapes, dimensions, wattages and finishes. Models 1052 and 1076 feature a special louver design which channels the light directly down eliminating glare, and they are especially suitable for applications requiring low brightness.

Emerson Electric Mfg. Co., 8100 Florissant Ave., St. Louis 36, Mo.

Product Briefs

(53) Eastern Specialty Co., Philadelphia, Pa., has announced production of a **transformer polarity checker,** used to check the correctness of polarity markings on transformers, through a range of sizes. . . . (54) A new line of **quartz infrared lamps** for military and industrial applications has been introduced by the Westinghouse Lamp Division, Westinghouse Electric Corp., Bloomfield, N. J.

(55) A new **silicone fluid,** called "Liquid glass," in collapsible metal tubes is now available for industrial use in sealing electrical connections to prevent arcing, flashover or short circuits. It was developed by Dow-Corning Corp., Midland, Mich. . . . (56) Mercury Hydraulics, Denver, Colo., has announced major design changes in their fully powered "Speed-Thru" **pipe pushers.**

(57) Carrier Corporation, Syracuse, N. Y., has added to its line of **heat pumps** a 3-ton model built in one weatherproof cabinet. . . . (58) Electrical Fittings Corp., Woodside, N. Y., has developed a new **wire pulling compound,** called "Wire Glide."

(59) Berko Electric Mfg. Corp., Queens Village, N. Y., has announced the development of new thermal safety cut-outs which are built into Electrofin **baseboard heaters.**

Catalogs & Bulletins

(60) PROGRAM TIME SYSTEMS. 20-page catalog details master time and program controls and secondary indicating clocks for both minute impulse and wired synchronous systems. Cincinnati Time Recorder Co.

(61) POLARITY CHECKER for transformers. Bulletin 107 describes test instrument for determining the polarity of any type transformer and for checking the correctness of wiring in a transformer-rated meter installation. Eastern Specialty Co.

(62) WIRING DEVICES. 16-page catalog is devoted exclusively to weatherproof devices, covers and boxes. Bell Electric Co.

(63) SILICONE TAPE. On-the-spot job estimating folder containing eight different samples of tape describes properties and principal electrical applications of each. H. K. Porter Co. Inc.

(64) RADIANT HEATING. 4-page brochure titled "Spots that Heat" describes Infratube zone-controlled electric heaters for spot heating of such locations as machine shops, loading platforms, outdoor cafes and bowling alleys. Apextro Products Co.

(65) PRIMARY BATTERIES. 6-page technical bulletin describes new silver-zinc battery system which combines features of both primary and secondary battery types for applications requiring high energy output. Yardney Electric Corp.

(66) FLOODLIGHTING. Bulletin 2719, 16 pages, gives data for planning and lighting parking areas, construction sites, shopping centers, etc., including footcandle charts and installation diagrams for both incandescent and mercury vapor lamps. Crouse-Hinds Co.

(67) MULTI-OUTLET SYSTEM. 6-page folder and two new data sheets describe No. 2000 and 2200 Plugmold and No. 3000, used as a ceiling duct for telephone installations in a reinforced concrete multistoried office building. Wiremold Co.

(68) BALLAST cross-reference guide shows catalog number equivalents for ballasts of other manufacturers plus rating table and mounting dimensions. Universal Mfg. Corp.

(69) CAPACITORS for power-factor correction in indoor 480- or 600-volt industrial applications, single- or 3-phase construction, 20 kvar, are described in 8-page bulletin PF-1200. Sprague Electric Co.

(70) PUSHBUTTON ENCLOSURES. Bulletin 136, 4 pages, covers variety of sizes designed for use with all standard makes of oil-tight pushbuttons, switches and pilot lights. Hoffman Engineering Corp.

(71) TROLLEY BUSWAY electrification systems for crane and hoist installations are described in Bulletin 76, including intermittent and continuous service ratings. Feedrail Corp.

(72) HOOK-ON METER for ac voltage and current measurements. Bulletin GEA-6292C, 4 pages, lists applications, current ranges, accuracy, and operating instructions. General Electric Co.

(73) COMBINATION STARTERS. 8-page folder ED-30 covers non-reversing starters through NEMA size 4 for use with either motor circuit switches or with circuit breakers. Cutler-Hammer Inc.

(74) POWER CAPACITORS. Bulletin GEA-6990, 12 pages, gives details of 50-kvar units and pole-top equipments for distribution circuits. General Electric Co.

(75) ELECTRIC EYE reference manual. 16-page Bulletin 571 describes miniaturized electric eye applications for counting, sorting, monitoring, assembling and weighing. Photomation, Inc.

(76) MOTOR CONTROL digest, 162 pages, presents condensed version of electrical control price book. Allis-Chalmers Mfg. Co.

(77) DECORATIVE LIGHTING color wheels for home and commercial use with blue, green and red lenses are described in Bulletin 1096; second folder 1040-59 covers line of gold or silver Orblites. Steber Mfg. Co.

(78) HIGH-VOLTAGE EQUIPMENT including transformers, power supplies, reactors and modulators for dc applications is described in Bulletin GEZ-2910, 12 pages. General Electric Co.

(79) ANNUNCIATORS which differentiate between equipment faults and an actual alarm in the protected system are covered in Bulletin 108. New 52-page Catalog 100C is also available describing entire line. Panalarm Div., Panellit, Inc.

(80) SILICON RECTIFIER power supplies. Bulletin GEA-6854, 4 pages, describes units rated 40-60 kv up to 700 ma for electrostatic precipitation uses. General Electric Co.

(81) SCAFFOLDS. 16-page brochure describes work platforms adjustable in 3-in. increments from 22 in. to 5 ft 8 in. Baker-Roos, Inc.

(82) BUILDING WIRE, Type THW, with 75C rating for wet and dry locations is described in specification sheet with attached sample, including table of carrying capacities. Ettco Wire & Cable Corp.

(83) MAGNET WIRES for hermetic motor applications. 19-page booklet includes table of test data for each type available. Anaconda Wire and Cable Co.

(84) VARNISHED CABLE with new Dacron glass tape insulation rated 0 to 15 kv, 85C, and 23 kv, 80C, is described with complete specs in Bulletin WC-8319. General Electric Co.

(85) BY-PASS LIGHTING. Bulletin GER-1598, 6 pages, discusses all phases of by-pass roadway lighting including the power distribution system and luminaire selection. General Electric Co.

(86) SAFETY STARTERS. Type L combination motor starters for such industrial equipment as heavy machine tools are discussed in Booklet B-7322. Westinghouse Electric Corp.

(87) ELECTRIC PLANTS. Catalog F-146, 8 pages, lists more than 45 basic models of gasoline and diesel engine-driven generator sets. D. W. Onan & Sons Inc.

(88) MAGNETIC CLUTCH suitable for braking duty in eight sizes from 10 to 200 lb-ft for such applications as tension control and cycling is described in Bulletin EPD 6126-3. Vickers Inc.

(89) THERMAL INSULATION. 6-page brochure describes correct practices for insulating electrically heated homes, covers commonly used electric heating methods, and gives factors for selecting right type for each home. Baldwin-Ehret-Hill, Inc.

(90) RECESSED LIGHTING. 20-page catalog shows enlarged line of recessed and accent fixtures for residential and commercial applications. Markstone Mfg. Co.

(91) GROUP RELAMPING plan for users of large quantities of fluorescent lamps. Booklet A-6832 points out how time and money can be saved. Westinghouse Electric Corp.

(92) TEST SET for anticipating insulation failure through non-destructive dc over-potential tests is covered in Bulletin 5-1.3. Associated Research, Inc.

(93) ALUMINUM CONDUCTORS—overload and fault current limitations. Engineering data includes description of overload and fault currents, with allowable-ties curves for both stranded aluminum and ACSR conductors for transmission or distribution lines. Aluminum Co. of America.

(94) ELECTRIC PLANTS. New 8-page price list SE-18 covers complete line of gasoline and diesel-electric plants in models up to 60 kw. Universal Mofor Co.

(95) RESIDENTIAL LIGHTING. New 52-page catalog shows full line of traditional, modern and contemporary designs. Virden Lighting.

(96) LOW-VOLTAGE SWITCHING. New pocket-sized Electrician's Manual, RM-610, covers layout and operation of low-voltage relay switching equipment. REMCON.

(97) CONSTRUCTION EQUIPMENT, including electric plants, trailerized floodlighting units, and flasher warning lights is described in 8-page bulletin. Pacific Mercury.

(98) PENDANT SWITCH available in 6- and 4-station models is featured in new bulletin along with toggle switches, molded-to-cable switches, and standard pushbutton switches. Joy Mfg. Co.

(99) MULTI-ARC WELDING. 71-page "Guide to Better Welding" gives principles, uses and advantages, comparing operating and maintenance costs of multi-arc and single-operator welding. J. B. Nottingham & Co. Inc.

New Books & Pamphlets

Operation School Burning, 272 pages, $4.75. National Fire Protection Assn., 60 Batterymarch St., Boston 10, Mass.

The official report on a series of experimental fires conducted in an abandoned school building. The behavior of heat and smoke under a variety of conditions in schools opens up possible new approaches to protective measures. Of special value to inspectors, engineers and architects.

Flash Point Index of Trade Name Liquids, 160 pages, $1.50. National Fire Protection Assn., 60 Batterymarch St., Boston 10, Mass.

A standard reference work for all who deal with flammable and combustible liquids listing more than 4500 products with data on flash point, name of manufacturer, principal use of product, and source of information.

New American Standards, available from American Standards Assn., Dept. PR 107, 70 E. 45th St., New York 17, N. Y.:

Guide for Loading Dry-Type distribution and Power Transformers. Standard C57.96, $1.35.

Issued as an appendix to the C57.12 series of standards to facilitate their use. Covers general recommendations for loading units having insulation systems limited to 150C and 220C maximum hot-spot operating temperature.

Conduit and Electrical Metallic Tubing: Three standards, C80.1-1959, C80.2-1959, and C80.3-1959; 80 cents each.

The three standards cover, respectively, rigid steel conduit (zinc coated); rigid steel conduit (enameled); and EMT (zinc-coated). Tables of dimensions and weights, coatings, and identification plus test and inspection procedures are included.

New NEMA Standards available from the National Electrical Manufacturers Assn., 155 E. 44th St., New York 17, N. Y.:

AB 1-1959: Molded Case Circuit Breakers, 40 cents.

This standard covers air circuit breakers, single- and multi-pole, assembled as an integral unit in a housing for current ratings up to and including 800 amps for nominal voltages up to and including 600 volts ac, 250 volts dc, and IC ratings over 1000 amps.

FU 1-1959: Low-Voltage Cartridge Fuses, 70 cents.

Information on the rating, performance, characteristics and manufacturing of Class H, J, L and M fuses rated at 600 volts or less.

HE 2-1959: Electric House Heating Equipment, 30 cents.

Definitions, ratings, markings, methods of test, performance, safety and durability of electric space heating types principally used in residences, such as baseboard heaters, wall heaters and heating cable.

Industrial Heating Units and Devices (Standard HU 1–1959); 30 cents.

This publication deals with cartridge, tubular, strip and immersion heaters, with information on

voltage and wattage ratings, dielectric strength, spacings, dimensions, terminations, sheath watts density and mounting holes.

Precision Snap-Acting Switches (Standard IC 3–1959); 30 cents.

This standard has been expanded to include information on the application of industrial limit switches. Part 1 of this publication defining terms used in connection with snap-acting switches remains unchanged.

Color Coding of Wires and Cables; (Standard WC–1959); 30 cents.

Color coding is discussed with regard to asbestos, asbestos-varnished cloth and asbestos-thermoplastic insulated wires and cables; textile coverings for flexible cords; POSJ cords; and rubber-insulated wires and cables.

Rubber-Insulated Wire and Cable for the Transmission and Distribution of Electrical Energy (Standard WC 3–1959); $4.00.

Detailed information on conductors; insulation; shielding and coverings; cabling; fillers, binders and circuit identification; testing and test methods; pole and bracket cable; nonmetallic neoprene-jacketed mine power cables; preassembled aerial cable using copper conductors; and neutral-supported secondary and service drop cables.

National Fire Codes. Six volumes, 5280 pages. $7 per volume; $35 for all six. National Fire Protection Assn., 60 Batterymarch St., Boston 10, Mass.

These codes, offered as a suggested basis for safety to life and property from fire, include Flammable Liquids and Gases, Combustible Solids, Dust, Chemicals and Explosives; Building Construction and Equipment; Extinguishing Equipment; Electrical Codes; and Transportation.

Standards for Safety for Armored Cable (ASA C33.9–1959); 75 cents. American Standards Assn., Dept. PR66, 70 E. 45th St., New York 17, N. Y.

This seventh edition of Underwriters' Laboratories' standard UL-4 covers the requirements of multiple-conductor armored cables for use in wiring systems operating at 600 volts or less at either 60F or 75F, including conductors, lead coverings and armor, describing testing apparatus and procedures cable must withstand to meet the standards.

NOT TOO HOT TO HANDLE

NEW Ettco THW BUILDING WIRE

with a rating of 75°C

for both wet and dry locations

- Lower in Cost
- Lighter in Weight
- Smaller in Diameter
- Smooth and Lubricated for easier pulling
- Better color definition (color is an integral part of insulation)
- Lower installation cost because of quicker installation
- Laboratory tested and inspected
- Available in all colors and sizes

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Boston, Mass.	Greensboro, N.C.	Nashville, Tenn.	San Francisco, Cal.
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Cleveland, O.	Jenks, Okla.	New Orleans, La.	St. Louis, Mo.
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Dallas, Tex.	Louisville, Ky.	Pittsburgh, Pa.	Tampa, Fla.

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Non-Metallic Sheathed Cable • Bushed Armored Cable • TW Building Wire
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Reader's Quiz

QUESTIONS from readers on problems of industrial equipment, installation, maintenance and repairs. Answered by electrical maintenance engineers and industrial electrical contractors out of their experience. For every question and every answer published we pay $5.00.

Short Lengths of Wire

QUESTION W36—We have a problem which I am sure many other contractors have, and that is a way to keep or store temporarily short lengths of wire and broken coils.

We find it pretty hard to get our electricians to use up short pieces of wire before opening new coils.

We would like to find out what others are doing along this line.—A.M.S.

ANSWER TO W36—We had a similar problem but I am happy to inform you that it no longer plagues our shop.

Since economic justification is always a primary consideration, we decided that with the present labor cost of over 6 cents per minute all short pieces of wire under 25 feet be tossed in the scrap heap, instead of being stored.

Next we provided bins for broken coils above 25 feet in length and these we marked "less than 100 feet", "100 to 300 feet" and "above 300 feet." These lengths are not measured, they are the result of judicious guessing and very effective, too.

The above applies to all cases where the wire is to be returned to the shop. On large jobs, wire is used until the length is proper for scrapping. With a little added effort, this system can be made to work.—J.A.M.

Current Rating During Plugging

QUESTION X36—The starting current in a 3-phase squirrel-cage motor is equal to the applied voltage divided by the equivalent impedance. This, then, is the maximum current that can flow in the motor. Yet, authors claim that during plugging, the current far exceeds this value. How is this possible?—J.A.M.

ANSWER TO X36—A purely qualitative answer to the question would be as follows—as stated in the question, it is agreed that starting current is determined by applied voltage and equivalent impedance; this current decreases as motor speed increases due to the induced counter-emf and becomes constant at a given speed (determined by load or slip). If the motor is plugged (reverse-torque braking) current is no longer limited by equivalent impedance, but is actually increased above normal inrush due to the counter-emf aiding instead of bucking the applied voltage.—C.W.M.

ANSWER TO X36—At the moment of starting, a squirrel-cage motor draws a heavy current. As soon as the motor starts turning it builds up a counter-emf which reduces the current. At full speed, no load, the counter-emf is almost as high as the applied voltage. As a consequence, the current is very small. If this motor is "plugged" the full counter-emf of the rotor is present but, as it were, in the wrong direction. It is no "counter" emf any more but abets the inrush current which, during plugging, will have a peak roughly twice as high as during initial start.—L.F.R.

ANSWER TO X36—The equivalent circuit for a three phase induction motor includes the apparent resistance of the rotor. This resistance varies as R divided by s, where s is the slip, the difference between the speed of the motor and its synchronous speed. When the motor is running normally the slip is on the order of 0.03 or about 3% and the impedance of the motor is high—it draws approximately full load current. When the motor is plugged, the slip is suddenly 1.97, the apparent rotor resistance is very small, and the motor draws a large current.

At standstill, the slip of the motor is only 1.0, the rotor resistance appears larger, so the current drawn is somewhat less than under plugging conditions. In other words the impedance of the motor is not a constant—it depends on the difference in speed between the rotor and the rotating magnetic field produced by the stator.

Actually, the stator resistance and reactance and that rotor reactance are not affected appreciably by the slip. These impedances mark the change in rotor resistance, and the change in current between standstill and nearly full speed against the motor's correct rotation (i.e. backwards) is not usually very large. If locked rotor current is 6X, plugging current might be 7X.

When a large motor is plugged, its residual voltage may be more important in terms of the current drawn, when the motor is reconnected to the line, than the fact that the motor is being plugged. A reasonable time delay before applying a plugging voltage is necessary for large motors. Sometimes direct current plugging is desirable since it does not involve this problem to a serious degree.—R.L.M.

Transformer Clearances

QUESTION Y36—We are to install a 750-kva oil filled outdoor transformer just outside the plant wall. Are there any code provisions or standards for minimum separation between transformer and building wall; or restriction as to openings or windows in the wall?—A.W.C.

ANSWER TO Y36—Section 4524 of the 1956 NEC enumerates necessary safeguards for oil-filled transformers installed outdoors. No definite separation between the building and transformer is specified.—C.W.M.

Editor's Note: Section 4524 of the 1956 NEC (450-25, 1959 NEC) does not specify the distance that transformers must be separated from buildings. Clearances are mentioned as follows: "Space separations, fire-resistant barriers and enclosures which confine the oil of a ruptured transformer tank are recognized safeguards. One or more of these safeguards shall be applied according to the degree of hazard involved in cases where the transformer installation presents a fire hazard." The hazard the code refers to is the possibility of fires originating in oil-insulated transformers. For example, where an oil-filled transformer is mounted on a pad adjacent to a non-combustible wall with no openings, most inspectors would not feel that this would present a fire hazard to the building.

On the other hand, if the transformers were adjacent to a combustible wall, inspectors would require the use of one or more of the

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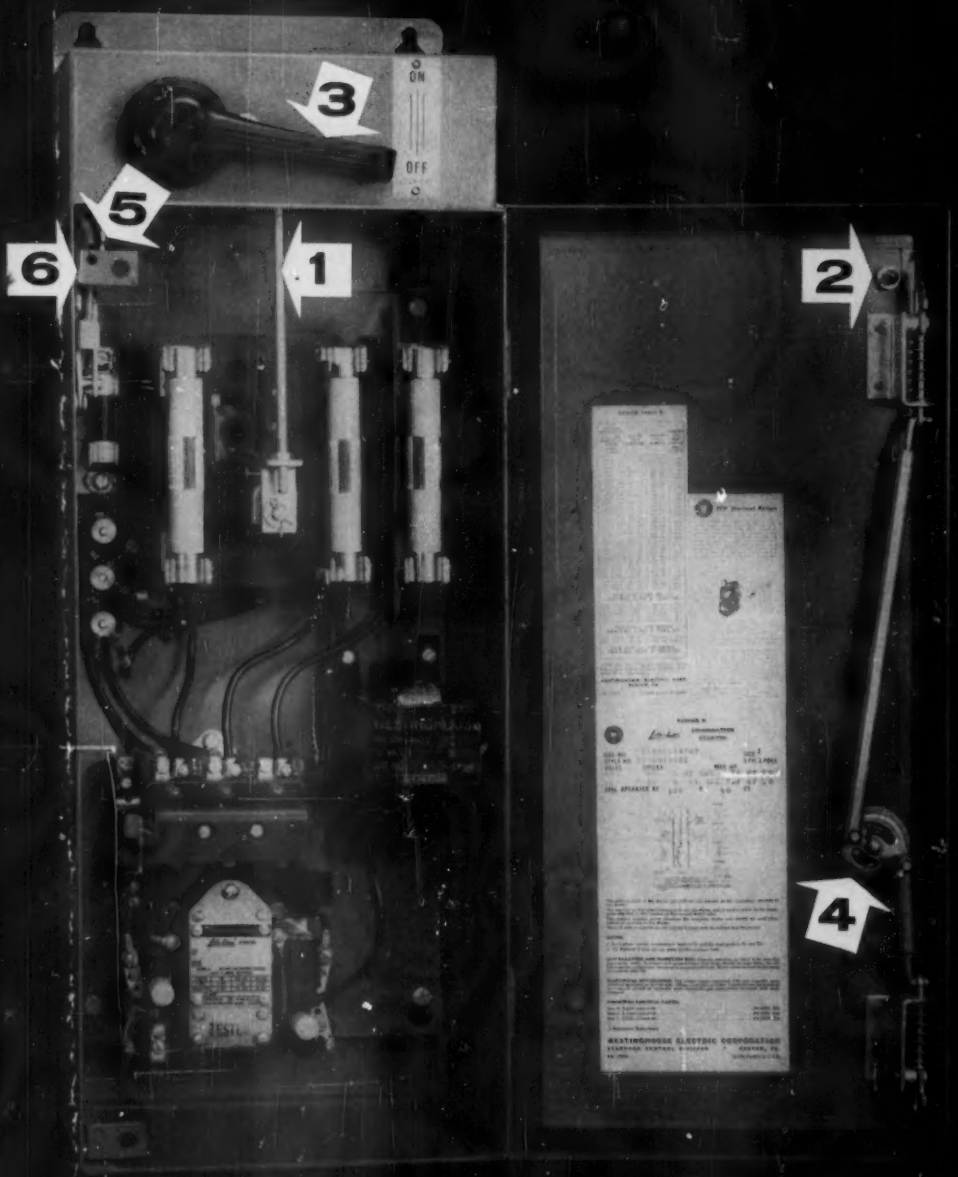

4 5 6

SAFE—Discourages tampering by unauthorized personnel. Tool required to open door.

SAFE—Accidental operation of disconnect impossible when door is open. Disconnect interlock must be deliberately voided to operate ON-OFF handle.

SAFE—Interlock prevents door from being opened when switch is on. ON-OFF handle must be in OFF position to open door.

J-30306

safeguards mentioned in the code.

If windows or doors are adjacent to the transformers, the inspector may require Class A fire doors or windows of the wired-glass type. This of course would apply to noncombustible walls since fire doors or fire windows would be meaningless in a combustible wall.

In this rule the code sets forth objectives, precautions and safeguards. The inspector will base his decision on circumstances surrounding each installation.—J.H.W.

Interrupting Capacity Calculations

QUESTION Z36—Is there a simple method of arriving at the current-interrupting capacity required in current protective devices for a given installation?—P.S.K.

ANSWER TO Z36—Even an elementary treatment of the subject of short-circuit current calculations is beyond the scope of the space allotted to this paper. But do not fret; there is a simple method of arriving at the current interrupting capacity required in current protective devices.

General Electric has designed a sliderule in the form of an "interrupting capacity calculator for the selection and application of molded case circuit breakers." This answers most questions encountered in general. The problems beyond the scope of the above should be referred to a circuit breaker application engineer. Other circuit protective device manufacturers publish similar calculators.

A book by Edith Clark, "Circuit Analysis of A-C Power Systems" Volume 1, is recommended as a comprehensive study of short-circuit currents.—J.A.M.

Editor's Note: Calculators, graphs and charts for computing short-circuit currents are offered by most manufacturers of overcurrent devices. However, they are and should be conservative. Other than this, there is no simple method of computing possible fault currents at any point in an electrical installation.

Many factors contribute to short-circuit capabilities. Included are the utility supply, induction motors, generators, synchronous motors and synchronous condensers. The utility supply includes the kva capacity of the primary source, transformer ratings, secondary voltage and transformer impedances. Short-cir-

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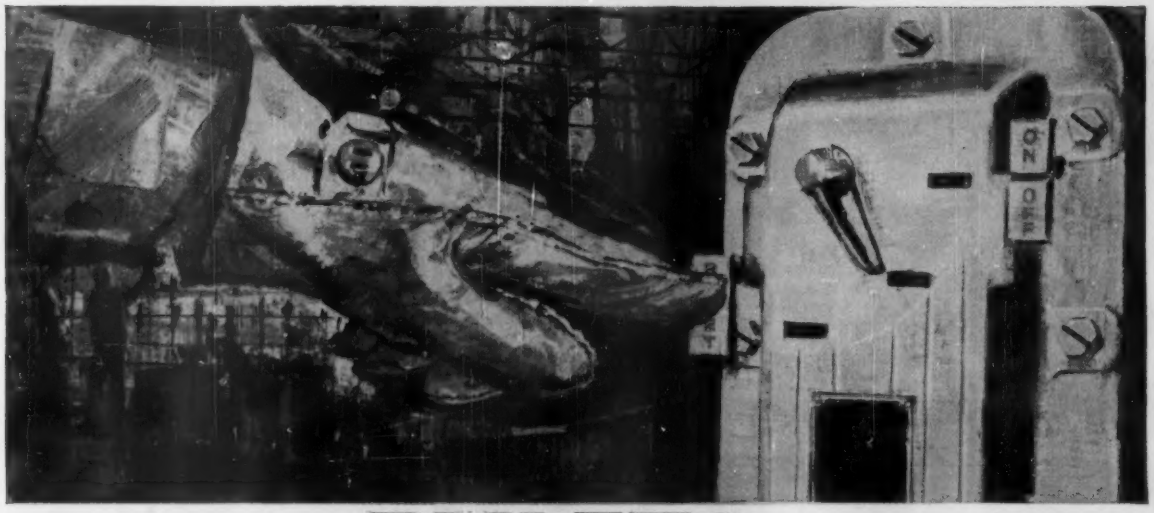

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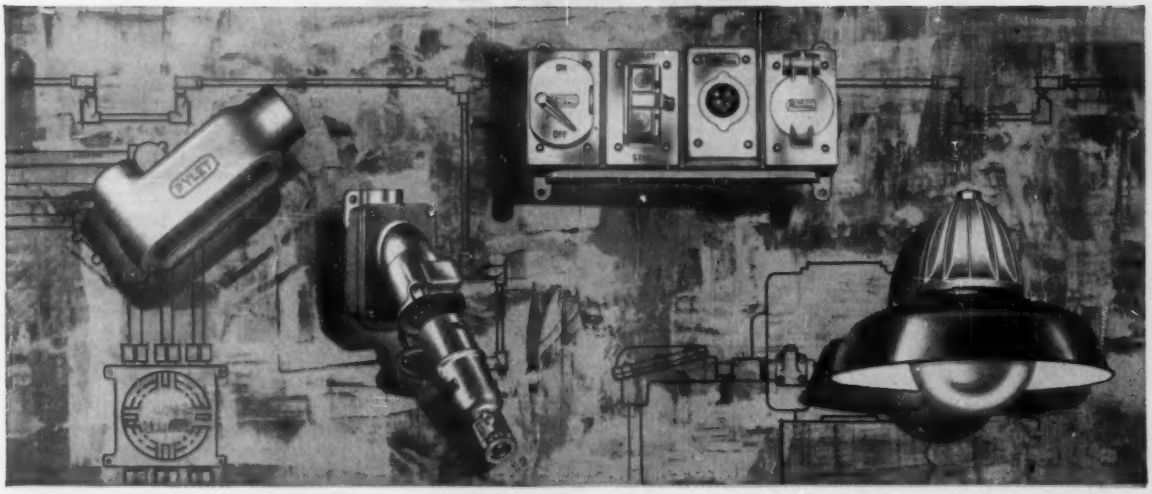

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cuit currents are reduced by increased conductor lengths and smaller conductor sizes.

Therefore, it is important to remember that the interrupting capacity requirements for circuit breakers and fuses are based on the short-circuit current available at the point of application.

Unless one fully inderstands the many ramifications of short-circuit calculations, he should obtain the services of a consulting engineer who makes such calculations on most of his jobs as a routine matter. —J.H.W.

Transistor Testing

QUESTION A37—At the plant where I am employed, there is a considerable amount of electronic control equipment. Some of the manufacturers are using transistors in their type of control. Is there any sure method of testing transistors and making repairs of this type without sending them to the manufacturer? Can a standard type voltmeter, ammeter, multimeter or oscilloscope be of any help in doing the above job? If the above instruments are not suitable, please suggest a more adequate means.—M.D.

ANSWER TO A37—I regret to say that there is really no sure way of testing transistors and making repairs to them. As a matter of fact, there is no way whatsoever of making a repair to a transistor. A transistor can be considered in the same category as an electric lamp bulb or a radio tube. When the electric bulb is gone, one discards it. When the radio tube is gone, one discards that. The same philosophy holds as far as transistors are concerned.

One of the most serious problems that has been encountered to date by the manufacturers of transistors is the difficulty of keeping them within specifications. They just are not under quality control at the present time. Within the past few years several of the manufacturers have claimed that they do have transistors under control but especially in the field of instrumentation, this is in reality not strictly correct. Transistors vary from batch to batch. Transistors made under the same code number will actually differ to a very great extent.

Possibly one of the best ways of checking transistors is in the actual circuit itself. If they perform there then they are good. If they do not perform, then regardless of what the meter says or what the transistor tester says, you must discard

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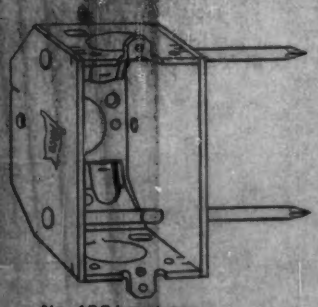

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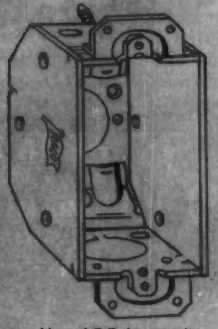

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them or try an alternate unit.

Where it is necessary to check out batches of transistors, then a useful device is a transistor curve tracer. The curve tracer actually gives the load curves of the transistor under operating conditions. This will do a real job for the serviceman but it does require an experienced man to handle it. There are other transistor testers on the market which give the current gain, etc. of the transistor; but frankly speaking, they don't tell the story, since the actual operating conditions may be such as to differentiate between two transistors both of which have about the same gain.

With reference to the question as to whether a standard type of voltmeter, ammeter etc. will do the job, I would very definitely say that the answer is no. If you replace the transistor and the meter reads satisfactorily, everything is all right, otherwise no.

One very important precaution to observe here when testing transistorized equipment is that a number of cases have occurred where damage to transistors has been caused by testing the circuit. What actually happens is that the transients developed by the test prod of the meter can knock out the transistor. It is not the same thing as with a radio tube where in many cases one can momentarily shortcircuit the tube without doing any serious damage to it. Transistors are a great deal more sensitive and momentary overloads and surges will definitely destroy them.—H.H.S.

ANSWER TO A37—A transistor can be checked by any of the instruments that are mentioned by M.D. in Question A37 if a circuit is properly arranged. I would suggest a complete simple PNP & NPN transistor checker. The theory part of this circuit and the construction of the checker will not be mentioned here. If a person has a little experience in electronics, he should be able to build this checker easily.

Procedure for using the checker:

1. Look up a transistor characteristic manual for the type of transistor being tested.

2. Plug the transistor into either the PNP or NPN socket before turning on switch No. 1.

3. Turn Switch No. 1 on and note the meter reading at room temperature. This value should be the same as Table I—low, medium, or high gain. If the current is very high, it indicates that the transistor is defective.

4. If the transistor checks good, close the gain switch. The reading should agree with the value in Table I. For a high gain type, it might go as high as 3 ma.

5. If pushbutton is used for the gain switch, switch No. 1 can be eliminated.—S.Y.

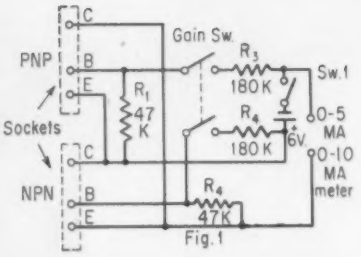

Fig. 1

Table I

Gain Sw.	Low gain	Med. gain	High gain
Open	Not to exceed 0.75 MA	Between low & high gain values	2 MA
Close	Should increase to 0.2 MA		The current increase indicates relative gain

Can You Answer These QUESTIONS?

QUESTION H37—Within one year, we have had eight out of 16 motors of our circulating roof fans burn out. Motors are 3 hp, 3-phase, 220 volts. Conductors are No. 10 TW. Location of protection, which is 30-amp fused switch and heater protection, is 75 to 150 ft away. Motor burns out the first time the fuses are blown. Heaters don't kick out. What possibly could be the cause of the excessive number of motor burn-outs?—J.J.B.

QUESTION J37—We have some 15-kva, 3-phase, 208-volt, 4-wire transformers installed in our office areas supplying lighting and power. These transformers generate a disturbing loud hum which we would like to reduce to a tolerable level. Can someone suggest the cause of this hum and a practical method for reducing it?—R.E.B.

QUESTION K37—What would be the effects of a fuse blowing in either of the primaries or secondaries of three transformers connected in star, to a 3-phase motor?—G.J.P.

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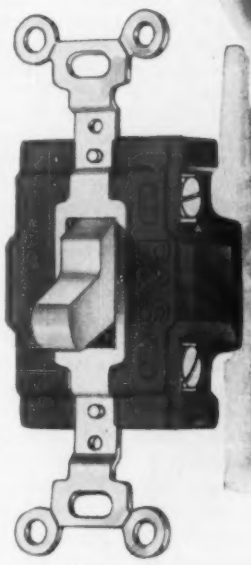
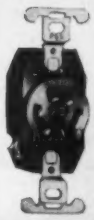


20AC 1 Ivory

5252-I



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Questions on the Code

Answered by:

B. A. McDONALD, *New York Board of Fire Underwriters, Rochester, N. Y.*
B. Z. SEGALL, *Consulting Electrical Engineer, New Orleans, La.*
R. E. WARD, *Chief Electrical Inspector, Insurance Department, State of Tennessee, Nashville, Tenn.*

Service Overcurrent Protection

Q. *No. 1. The provisions of Section 2371-a (230-90(a), 1959 code) read in part as follows: "Overcurrent Protection. In Ungrounded Conductor. Such protection shall be provided by an overcurrent device in series with each ungrounded service conductor, having a rating or setting not higher than the allowable carrying capacity of the conductor, except as follows:"*

Kindly clarify the intent of the exceptions.—J.O.

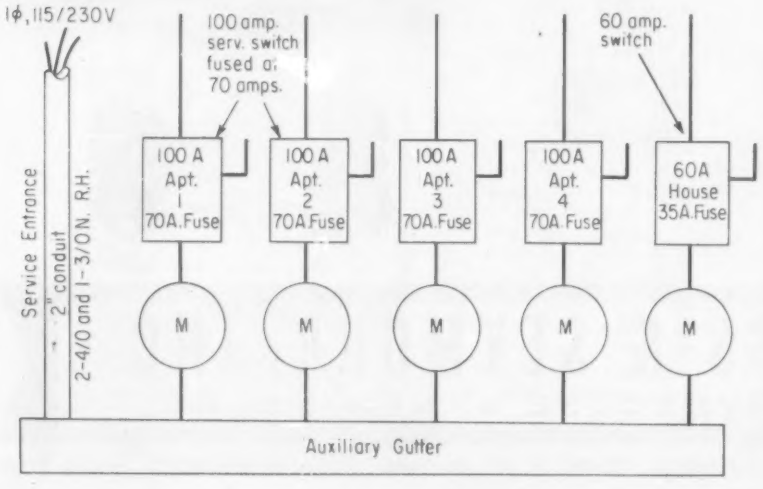
A. The first exception recognizes the starting-currents of motors as covered by Sections 4342, 4362 and 4363 (430-52, 430-62, and 430-63). The starting current of a 3-phase, 220-volt, squirrel cage 10-hp motor, thrown on the line, may be computed as high as 600% of its full-load current rating of 27 amps. As a result, an overcurrent device rated at 108 amps may be used to protect the conductors serving such a motor. Since the conductors only have a current-carrying capacity of 125% of 27 amps, 34 amps, it appears that they are not adequately protected. This concept however is not entirely correct since the conductors are protected from gradual overload by the overcurrent devices protecting the motor. The first exception recognizes the fact that the starting current of motors must be considered when computing the size of the service overcurrent device. As a result, such an overcurrent device could exceed the allowable carrying capacity of the service conductor when motors are involved.

Where references give 1956 National Electrical Code section numbers, the numbers in parenthesis denote the corresponding section in the new 1959 Code.

The second exception covers the ratings of circuit breakers as covered by Sections 2403-b-c (240-7a and 240-5, exception 2). This rule, through reference to subparagraph 9 of Tables 1 and 2 (note 10 to Tables 319-12 through 310-15), permits circuit breakers of the nonadjustable trip type to be one size larger than the allowable current-carrying capacity of a conductor when a standard rated breaker does not correspond with the current rating of the conductor. In the case of motors, as discussed above, the rating may be as high as 400% of the starting current of the motor.

Exception No. 3 permits not more than six circuit breakers or six sets of fuses to serve as the overcurrent protection for a service. The illustration, submitted with your question is an application of this exception. A set of fuses is all the fuses required to protect all the ungrounded conductors of a circuit. As an example, two fuses comprise a set for a single phase 3-wire service with grounded neutral, or three fuses comprise a set for a 3-phase, 4-wire wye service with grounded neutral. In the example shown we have five service disconnecting switches as permitted by Section 2351-a (230-70g), and five sets of service fuses as permitted by Section 2371-a-3 (230-90, exception 3).

Exception No. 4 covers multiple occupancy buildings. In the example shown, individual service-entrance conductors could have been run to each apartment, provided the building does not have occupancy above the second floor, and each apartment could have had as many as six service disconnects and six sets of fuses, or six circuit breakers.



Q. *No. 2. The 4-unit apartment building shown has a unit load per apartment of 65 amps. Demand factor applied. Electric range and air conditioner included. Total load for building 170 amps. Demand factor applied.*

4 Air Conditioners—
Total load—51 Amps
4 Ranges—
Total load—74 Amps
SERVICE: 2-in. conduit. 2—4/0 and 1—3/0 neutral. RH insulated conductors. 230 amps without main disconnect. Each unit has 100-amp fuse cabinet, may be fused at 70-amps. House panel has 60-amp fuse cabinet, may be fused at 35 amps. May Table 29 (220-5) Col. A, be used for built-in range and oven with total load of 12,000 watts or less? Is this installation permissible according to N.E. Code?—J.O.

A. It is difficult to accurately appraise the method for computing feeder and service conductors, in the absence of any advice concerning the size of each apartment, and the load supplied by the house meter. Assuming that each apartment has an area of 800 sq ft the load would be computed as follows:

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Another great convenience for the user lies in the fact that a convertible auxiliary contact can be added to either or both sides of the Type BR relay—having full switching capacity—without disturbing the wiring or removing the relay. These auxiliary poles are easily mounted from the front.

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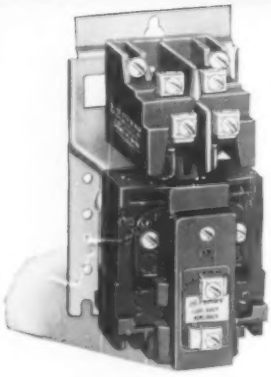
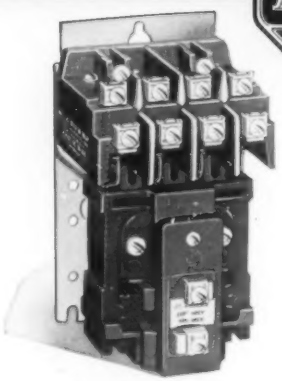
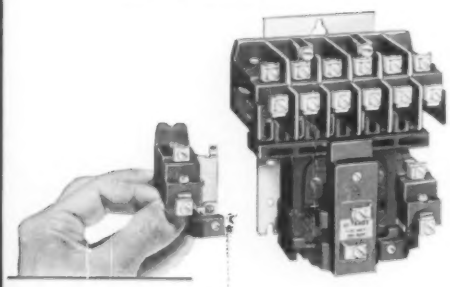


Two Pole Construction



Four Pole Construction

Six Pole Construction



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An auxiliary convertible contact pole—having full switching capacity—can be easily added to the left and right sides of the Type BR relays. These auxiliary poles are front-mounted and can be added without disturbing the wiring of the relay—and without removing the relay. All relays are designed to also accept stab connectors, and—all terminals are accessible from the front.

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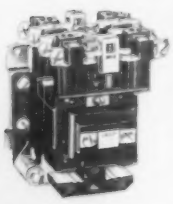

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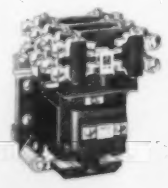

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Quality Motor Control

Load for each apartment:	
800 sq ft at 3 watts/sq ft (lighting)	2,400 watts
Small appliance load	1,500 watts
Load without range or conditioner	3,900 watts
Demand load:	
3,000 watts at 100%	3,000 watts
900 watts at 35%	315 watts
Range load	8,000 watts
Air conditioner 13 amps at 230 volts	2,990 watts
Total load	18,205 watts
Size feeder to each apartment:	
18,205 divided by 230 volts...79 amps	No. 4 RH copper
Load for 4 apartments:	
Lighting and appliances, 4 times 3900.	15,600 watts
Demand load:	
3,000 at 100%	3,000 watts
12,600 at 35%	4,410 watts
Lighting and appliance load	7,410 watts
Range load, Table 29 (Table 220-5, Column A	17,000 watts
Air conditioners 51 amp at 230 volts	11,730 watts
Total load, 4 apts.	36,140 watts
Load in amperes, 36,140 divided by 230	157 amps
House meter load (assumed)	35 amps
Total load	192 amps
Size of service conductors:	No. 3/0 RH copper

On the basis of 800 sq ft per apartment, it appears that the (4/0—3/0 neutral) service more than satisfies code requirements. The service diagram shows the feeder to each apartment fused at 70 amps. According tc our computations the load at each apartment is 79 amps, which requires a No. 4 RH copper feeder. It could be protected by an 80-amp fuse.

The service combination of five fused disconnecting switches satisfies the provisions of Sections 2351 (230-70) and 2381 (230-90), provided they are approved for service use.

At the present time, the status of the components of a range is not clearly covered by the code. When the combined load does not exceed 12,000 watts, many inspectors have applied the demand loads covered by Table 29 (Table 220-5), Column A. The 1959 Code includes under the heading of Table 220-5, wall-mounted ovens and counter-mounted cooking units. The 2-in. conduit is adequate for 2-4/0 and 1-3/0 conductors. — B.A.McD. — 12/59/1

Operating Room Lighting

Q. *Is it a requirement for the frame of a hospital operating room light to be grounded? If so, what method of grounding may be used for grounding a suspended hospital room surgical light that is mounted on metal tracks and can be adjusted by persons standing on the floor near or at the operating room table. Such lamp is factory wired and supplied by a 2-wire cord with no grounding conductor or provisions made for grounding. This flexible cord allows the moving of the light fixture on the tracks and for other adjustments that can be made.—A.B.H.*

A. It is a requirement that this light be grounded. Section 5135(i) states:

"Grounding. In any hazardous area, all metallic raceways, and all non-current-carrying metallic portions of fixed or portable equipment (except equipment operating at not more than 8 volts between conductors) shall be grounded as provided in paragraphs a and b section 5026 of Article 500."

Section 5026 a and b state:

"a. Exposed Parts. The exposed non-current-carrying metal parts of equipment such as the frames or metal exteriors of motors, fixed or portable lamps or appliances, lighting fixtures, cabinets, cases, and conduit, shall be grounded as specified in Article 250 of this code."

"b. Bonding. The locknut-bushing and double-locknut types of contacts shall not be depended upon for bonding purposes, but bonding jumpers with proper fittings or other approved means shall be used. If flexible conduit is used as permitted in subparagraph b of section 5014, bonding jumpers with proper fittings shall be provided around such conduit."

The method of grounding is covered by Article 250 of the National Electrical Code and Section 2557 gives the methods for fixed equipment. I would class the track and mountings of the fixture as fixed equipment and recommend grounding with a wire or strap from the frame or tracks of this fixture to a grounding conductor. In order to assure continuity between the rollers of light and track, a flexible wire or strap may be used from the lamp housing to track or frame as is permitted under 2559 (c), 1956 National Electrical Code.

Your question states that the lamp is factory wired with 2-wire cord. Attention is called to Section 5135 (c)-4 which states:

"Flexible cords which are or may be used in hazardous areas for connection to portable equipment, appliances or lamps operating at more than 8 volts between conductors shall be of a type approved for extra hard usage, shall be of ample length, and shall include an additional insulated conductor for grounding. Receptacles and attachment plugs shall be of polarized type with provisions for connection of the grounding conductor, and if located within a hazardous area, shall be approved for Class I locations. A storage device for the flexible cord shall be provided, and shall not subject the cord to bending at a radius of less than 3 inches."

From this section it would seem that the manufacturer should have provided a cord with a grounding conductor or other means for grounding provided. — R.E.W. — 12/59/2

Residential Wiring

Q. *In a residence wired with non-metallic sheathed cable using metal boxes, is it a requirement that the metal boxes be grounded where such house is insulated with aluminum foil insulation in contact with the metal boxes? What method of grounding may be used if required?*

As the house is already completed with wiring installed, can approval be given if metal boxes are replaced with non-metallic boxes where in contact with the foil insulation?—W.M.R.

A. In answer to the first part of your question, yes. Section 2533, 1956 National Electrical Code, states:

"Other Conductor Enclosures. Metal enclosures for conductors shall be grounded, except in runs of less than 25 feet which are free from probable contact with ground, grounded metal, metal lath or conductive thermal insulation and which, if within reach from grounded surfaces, are guarded against contact by persons."

The method of grounding is covered by Section 2557 a, b, and c as follows:

"a. By a grounding conductor run with circuit conductors; this conductor may be uninsulated, but if it is provided with an individual covering, the covering shall be finished to show a green color.

"b. By a separate grounding, con-

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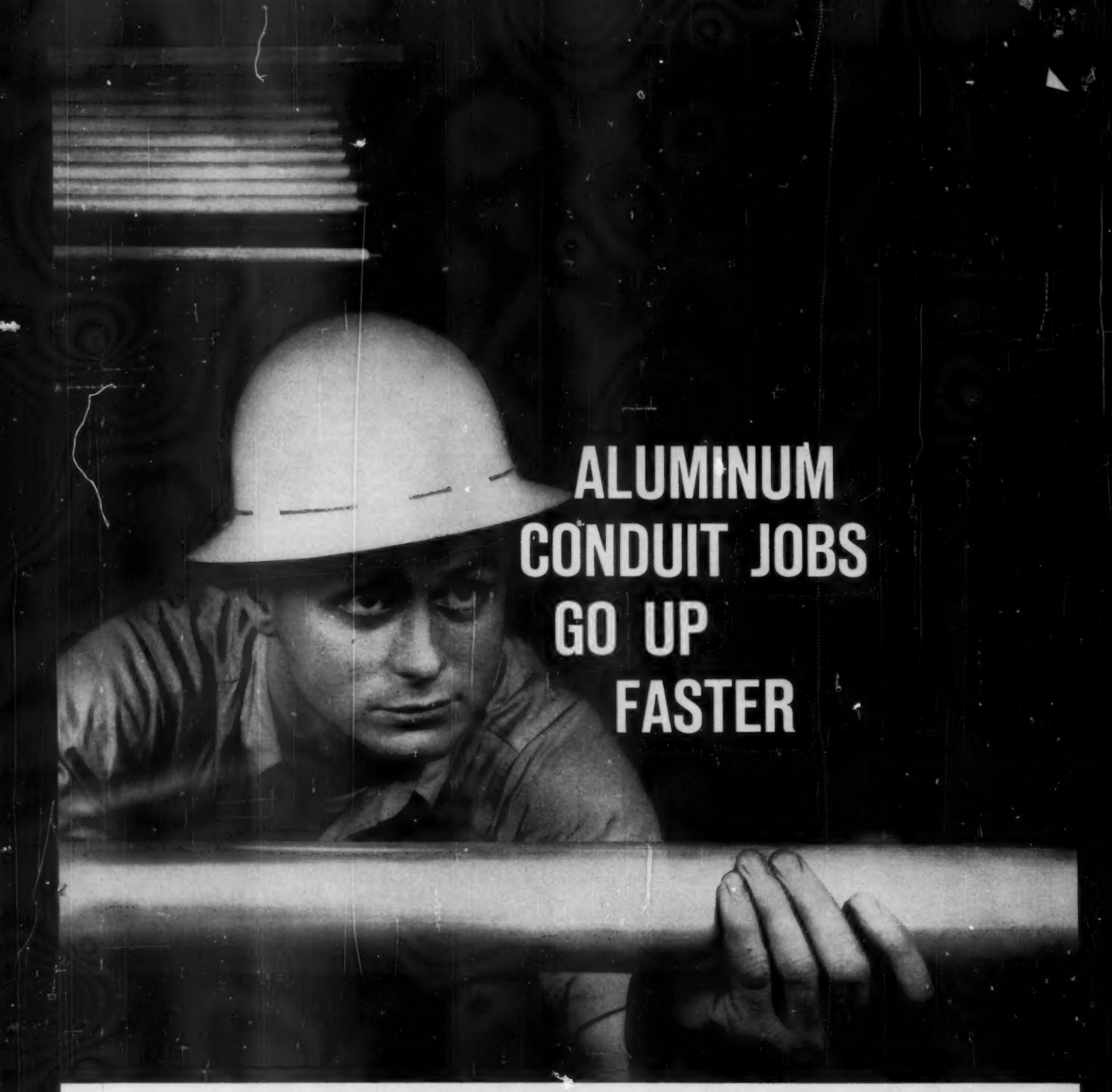

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ductor installed the same as a grounding conductor for conduit and the like;

"c. By special permission, other means for grounding fixed equipment may be used."

In answer to the last part of your question regarding the use of nonmetallic boxes in contact with foil insulation, this does not violate code rules.—R.E.W.

Editor's Note: Try insulating the metal box from the foil in this instance.—J.H.W.—12/59/3

Wiring of Welders

Q. *Would you please send me your interpretation of Section No. 6331 of the 1956 NEC.*

My problem is on No. 6331-a, paragraph 2. If I connected a 70-amp 3-phase 120/208 voltage 3-wire with 50% duty cycle welder to a bus duct run, how would the circuit be calculated, and also if two such welders were on same feeder? What size disconnecting means, fuse size, and wire size?—K.A.L.

A. The provisions of Section 6331-a-2 of the code (Section 630-31-a-2 of 1959 Code) covers the requirements for computing the size of the branch circuit conductors of a resistance type welder for a specific operation. It reads as follows:

"The rated current-carrying capacity of the supply conductors for a welder wired for a specific operation for which the (actual) primary current and duty cycle are known and remains unchanged shall be not less than the product of the (actual) primary current and the multiplier given below for the duty cycle at which the welder will be operated."

The multiplier for a 50% duty cycle is .71. It is significant to note that the (actual) primary current, not the (rated) primary current must be used when computing the size of the circuit conductors. It is likewise important to note that the rule applies only to a specific operation. Any change in operation may require larger conductors. The actual primary current usually exceeds the rated primary current. According to Abbott's National Electrical Code Handbook the actual primary current is described as follows:

"When a resistance welder is set for a specific operation, the transformer taps are adjusted to provide the exact heat desired for the weld; then in order to apply subparagraph 2 the actual primary current must be measured. A special type of ammeter is required for this measurement because the current impulses are of very short duration, often a small fraction of a second. The duty cycle is controlled by the adjustment of the controller for the welder."

According to Section 6331-c (630-31 c) the "actual primary current is the current drawn from the supply circuit during each welder operation at the particular heat tap and control setting used." When this current value is not given by the manufacturer for each heat setting and welding control, one must resort to the use of an ammeter.

If, in the case of the example presented, 70 amps represents the actual primary current as above described, the size of the conductors for a 50% duty cycle would be .71 times 70 which equals 49.7 amps. It is very important, to the effective operation of the welder and the absence of over heating of conductors, that the 70-amp rating is the actual and not the rated primary current. This important factor should be checked.

When two of such rated welders are connected to a feeder, the provisions of Section 6331-b (630-31 b) which reads as follows applies:

"The rated current carrying capacity of conductors which supply two or more welders shall be not less than the sum of the value explained in paragraph "a" of this section for the largest welder supplied, and 60% of the value obtained as explained in paragraph "a" of this section for all the other welders supplied."

This code rule is interpreted by Abbott's N.E. Code Handbook as follows:

"The procedure in determining conductor sizes for an installation consisting of a feeder and two or more branch circuits to supply resistance welders is first to compute the required carrying capacity for each branch circuit. Then the required feeder carrying capacity is 100% of the highest carrying capacity required for any one of the branch circuits, plus 60% of the sum of the carrying capacities of all the other branch circuits."

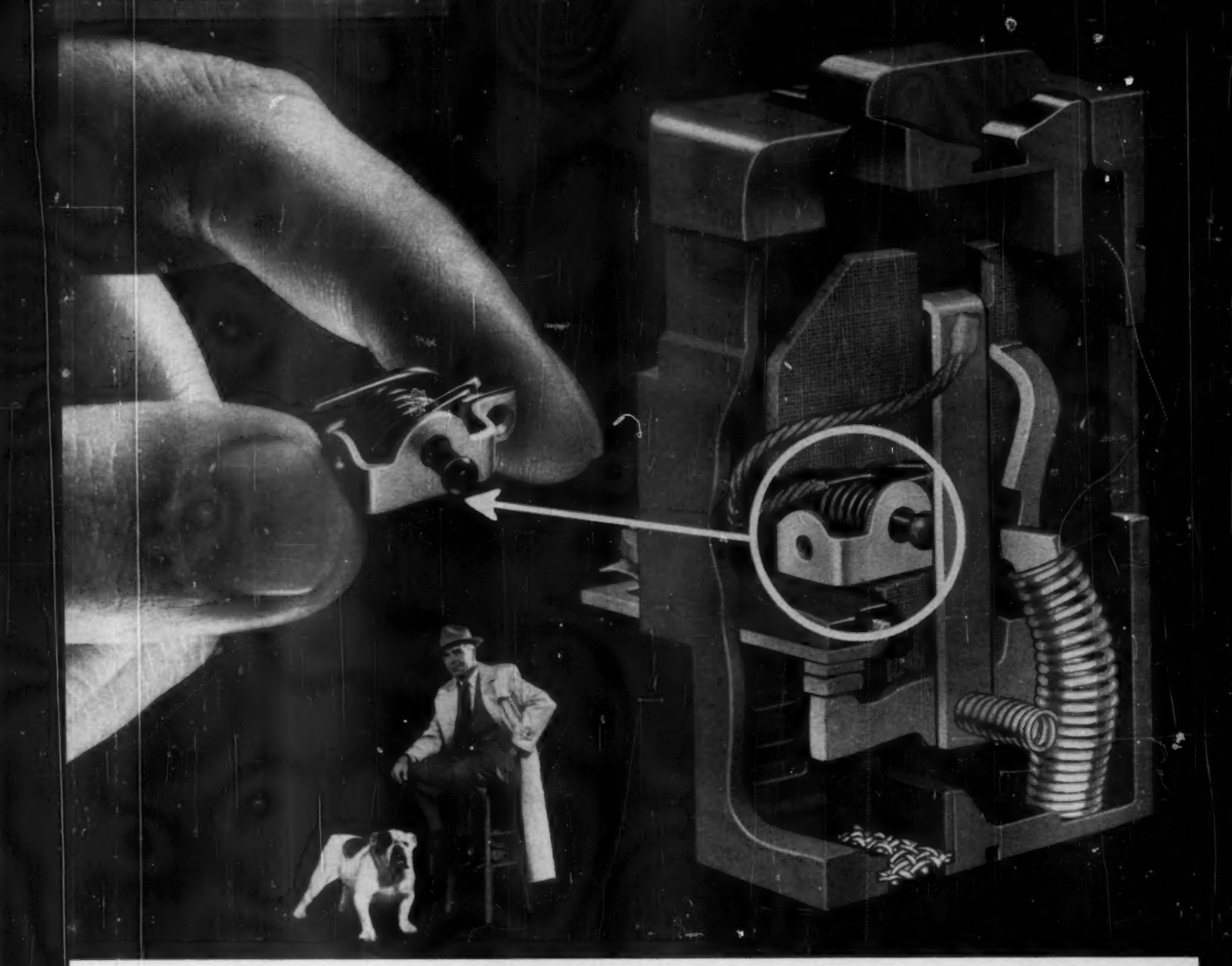
Again assuming that 70 amps is the actual primary current of each welder, each branch circuit must have a current capacity of 49.7 amps. The current-carrying capacity of a feeder serving the two welders would be 49.7 amps plus 60% of 49.7 amps which is equal to 79.5 amps.

According to the provisions of Section 6333 (630-33) the current-carrying capacity of the disconnecting means serving each welder shall not be less than the supply conductor rating determined as explained above. In this case, the disconnect must have a minimum rating of 49.7 amps.

According to the provisions of Section 6332-a (630-32 a), each welder shall have an overcurrent device rated or set at not more than 300% of the (rated) primary current of the welder, except that a welder having a supply circuit protected by an overcurrent device rated or set at not more than 300% of the rated primary current of the welder. It is significant to note that the overcurrent device for each welder is based on its rated and not its actual primary current. In the example under discussion, we have assumed that the 70-amp rating is the actual primary current. As a result the rated primary current is unknown, and we cannot specifically answer this question.

According to the provisions of Section 6332-b (630-32 b), conductors which supply one or more welders shall be protected by an overcurrent device rated or set at not more than 300% of the conductor rating. In the case of the example presented, each welder requires 49.7 amps or a No. 6, Type R conductor, rated at 55 amps. The overcurrent protection could be set at 300% of 55 which is 165 amps. The overcurrent protection for a feeder serving both welders, with a total load of 79.5 amps, when wired with No. 3, Type R, conductors having a current capacity of 80 amps, would be 300% of 80 amps which gives us 240 amps. These values however are subject to exceptions covered in the introductory paragraph of Section 6332 (630-32).

It is quite possible that the 70-amp rating given in the example is not the actual primary current. If it is, the calculations are correct. If not, they are incorrect. The distinction between "actual primary current" and "rated primary current" is very important and must be observed if we wish to avoid a code violation. Abbott's N.E. Code Handbook is a McGraw-Hill publication, and is sponsored by the National Fire Protection Association. It has proven, over many years, to be a valuable and reliable source of information on code rules.—B.A.McD.—12/59/4



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Rewiring for Extra Receptacles

Q. *Our city building code states:*

"Should a building be remodeled to an extent of 35% or less, such remodeling does not require the entire building to be brought up to the existing city code throughout."

My question is with reference to Section 2124 (b), 1956 National Electrical Code in regard to enforcement of this throughout an existing dwelling where the only alterations or additions to the building are in connection with the wiring.—R.M.T.

A. Your question concerns the number of receptacle outlets that shall be installed. The National Electrical Code outlines minimum safe installation practices and does not attempt to state whether the practice applies to new installations or old installations unless there is some special consideration like that given to the size of wires in rewiring work, so there never is any specific statement in the code about where it is to be enforced. The code is advisory with no particular status locally unless it is adopted by local ordinance or regulation or state legislation. From that standpoint your question relates more to what is the practice of local inspection authorities rather than the intent of the code.

You stated in your question that your building code exempts where the remodelling is under 35%. Of course, in your case, the remodelling is on rewiring. Therefore, it seems to me that your question should be presented to your attorney and get his ruling as to the intent to include rewiring or remodelling as the case may be. In the State of Tennessee we have a state regulation that covers the rewiring of an existing building and this rewiring of an existing building does not require that Section 2124 (b) be followed to the fullest. It is our belief and our policy that improvements made on electric wiring even when below the required standards for new wiring are an improvement and any corrections made to existing hazardous installations will improve our record. It is also our belief that many jobs are improved by having such a regulation in that no work would be done if the requirements for remodelling of old wiring were the same as for new installations.—R.E.W.—12/59/5

Cables in Concrete

Q. *Will an installation made as follows meet the requirements of Section 4285, 1956 National Electrical Code, subject being installation of cables in concrete or poured masonry floors?*

The ground is levelled and covered with sheets of pre-molded membrane 4 ft by 8 ft, ¼ in. thick, this membrane being waterproof asphalt-fibered material sealed at the joints with asphalt. Approved cable is stapled to this base on 1½-in. centers with all material used being approved material using an approved stapling machine to staple the cable to the fibered material. After the cable is in place, it is then covered with 4 in. of concrete. The non-heating leads are protected by being installed in conduit using approval bushings, etc. —J.E.G.

A. The above installation does meet the requirements of Section 4285, 1956 National Electrical Code. (422-37).

No mention is made in your question as to the use of reinforcing steel or wire mesh. If such is used, it shall be spaced at least 1 in. above the cable using suitable nonmetallic inorganic spacers to hold the reinforcing material or mesh away from the cable as is required by Section 4285 (c) (422-37c) which is as follows:

"A spacing of at least 1 in. shall be maintained between the heating cable and other metallic bodies embedded in the floor."—R.E.W.—12/59/6.

Readers Comment

Claude H. Arbuthnot of Lake Alfred, Fla., calls attention to an inadvertent error which appears on page 191 of the July 1959 issue of our publication. He comments as follows:

"I notice an error on page 191 of your July '59 issue which I suppose is a misprint. In the bottom paragraph of the middle column, section 2337 of National Electrical Code has been incorrectly quoted to 'require' instead of 'forbid' the connection 'above' the service head. The next sentence in the same paragraph points out the error."

Our thanks to Mr. Arbuthnot for taking time out to advise us of this error. It was not a misprint; it was incorrectly written.—B.A.McD.—12/59/7.

TAXES

The Tax Effect of Depreciation

Details on the application of tax deduction formulas for depreciation of equipment.

ANY tax deduction is a thing to cherish at filing time for it has the effect of reducing your taxable income, but there are a few deductible items that have the rather special characteristic of flexibility. One of these is the deduction you are allowed for depreciation.

For example, let's say that the total amount you are allowed for depreciation of a particular machine is $5,500, which is to be deducted over the ten year period you have estimated as the useful life of the machine. Your deduction in the first year may be as low as $550, or it may be as high as $2,160. The amount you decide to deduct will certainly have an effect on your taxable profits for the year.

The amount you deduct for depreciation in a particular year will vary according to the method you choose to depreciate your equipment. Several approved methods and the tax effect of each are discussed here by the American Institute of Certified Public Accountants.

The Ground Rules

When you purchase a piece of equipment that you intend to use in your business for more than a year, you cannot write off its cost as an expense in the year of purchase. However, you can deduct a portion of its cost as depreciation over the years of the equipment's useful life to the business.

Now, how long will the piece of equipment be useful in the business? This is a decision you must make in the year you purchase depreciable equipment. To aid you in making this decision, the Treasury Department has prepared a guide, Bulletin F (available from the U. S. Government Printing Office), which lists the estimated useful lives of many types of equipment that may be used in a trade or business.

However, Bulletin F is merely a guide. The life span it lists for a particular piece of equipment could be called the economic or useful life span. If the conditions in your business are such that a new machine will receive more or less than usual use, then you should consider this in arriving at your own estimate of the period the machine can reasonably be expected to be useful to you.

Another decision you must make in the year of acquisition is how much can you expect to get for the machine at the end of its useful life, that is, what will its salvage value be. Here, there are no government guides to help you. Fortunately, the only requirement is that your estimate be "reasonable."

The Changing Profit

Having estimated the useful life and salvage value of your equipment, you can easily determine the total amount you will be allowed to deduct for depreciation over the years. For example, if a new machine costs you $6,000, has an estimated useful life to you of ten years, and a salvage value of $500, your total depreciation deduction for the machine will be $5,500 . . . . never more. The Internal Revenue Service takes the view that you may not claim depreciation deductions below a reasonable estimate of the equipment's salvage value.

Now comes the question of how to claim your deductions. Depending on the method of depreciation you choose to use, your deduction for the first year may vary as much as $1,610, from $550, to $2,160. Here are three approved methods for handling your depreciation.

Straight-Line Depreciation

Using the straight-line method, you subtract the estimated salvage value from the cost or other basis of the equipment and spread the balance in equal yearly amounts over the equipment's useful life.

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TAXES [Continued]

Declining-Balance Depreciation

The declining-balance method can only be used on new equipment with a useful life of three years or more. Salvage value does not have to be subtracted from the cost for figuring the depreciation, but you must not depreciate below a reasonable estimate for salvage. The depreciation is computed by applying a fixed percentage each year to the balance of unrecovered cost. This rate may not be more than twice the yearly percentage that would be used in the straight-line method. Thus, in the case of an asset with an estimated useful life of 5 years, the rate would be 40%, a 10-year life, 20%, and so on.

Sum of the Years-Digit Depreciation

The sum of the years-digits method also can be used only for new equipment with a useful life of three years or more. The depreciation is computed by applying a fraction to the cost less the estimated salvage value. The numerator of the fraction is the number of years of useful life remaining, and the denominator is the sum of the years-digits corresponding to the estimated useful life. If the useful life were ten years, the denominator would be 55 (10+9+8+7+6+5+4+3+2+1.) In the first year, depreciation would be 10/55ths of cost less salvage value; for the second year 9/55th, etc.

Dollars and cents provide a good measure for comparing the effects of each of these methods. Let's stick with the example of the $6,000 machine. It has a useful life to the business of ten years, and an estimated salvage value of $500. The total amount to be depreciated then is $5,500. What could you deduct each year using one or the other of these methods?

Year	Straight Line	Declining Balance	Sum of the Years-Digits
1	$550	$1,200	$1,000
2	550	960	900
3	550	768	800
4	550	614	700
5	550	492	600
6	550	393	500
7	550	315	400
8	550	252	300
9	550	201	200
10	550	161	100
	$5,500	$5,356	$5,500

Note that with the declining-balance, the full amount of available depreciation was not deducted during the useful life of ten years. This sometimes happens with the declining-balance method. However, the unrecovered balance is not lost as a deduction. It will be available when the property is sold, retired or abandoned.

Additional First-Year Depreciation

If you wish, you can increase your deduction in the first year, regardless of the method you use, by taking advantage of an additional first-year depreciation allowance of 20%. This allowance was created as a part of the 1958 Technical Amendments Act specifically to help the smaller business overcome the drain on capital of equipment purchasing and is available only in the first year for which depreciation on the equipment may be claimed as a deduction. Here is the way this allowance works:

You can take the additional first-year depreciation allowance of 20% on equipment costing a total of not more than $10,000 ($20,000 on a joint return.) The equipment must have a useful life of six years or more. The allowance would be subtracted from the cost of the equipment without consideration of salvage value. The remaining balance would be the basis for computing your regular method of depreciation. In other words, on our $6,000 machine, the 20% allowance would be $1,200, leaving $4,800 to which you can apply any of the approved methods of depreciation subject to the rules for the treatment of salvage value.

Thus, if straight-line depreciation were used, the total depreciation deduction for the first year would be $1,630; the declining-balance depreciation $2,160; and the sum of the years-digits depreciation $1,982.

As you can see, using one method rather than another can certainly affect your taxable income for the year. The question is, would it be better to have larger deductions this year and in the next couple of years which would taper off sharply in later years, or would it be better to even out your deductions over the entire period? There is no pat answer. You can only make the right decision in light of your pre-

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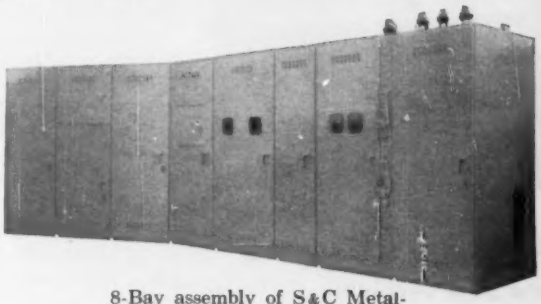

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TAXES [continued]

sent operations and your budgetary forecast.

One consideration is that a large deduction in the first year will save taxes immediately (rather than later) and provide additional funds for self-financing. Then again, a company with low current earning but good future prospects might prefer to save some of the deduction for later years by using the straight-line method. These are two possible considerations, but there are others. A certified public accountant could guide you to the right decision for your business.

Additional Information

This article presents merely the bones of depreciation. There are a number of other questions you may need answered. For example, what happens if you sell the equipment before or even at the end of its useful life and make a gain or loss on the sale? What happens if you trade-in old equipment on new equipment? Does it make any difference whether depreciable equipment is purchased at the beginning of the year, middle of the year or end of the year? Can you change your method of depreciation? For answers to these and other questions about depreciation, and, in fact, about other business problems, your best bet is to seek the advice of an expert.

SUPERINTENDENT Bill Bryan pictured at drafting desk in "job shanty" is in charge of electrical work for a 24-room electrical heated school currently under construction in Anderson, Ind. Bill is employed by the Martzolf Electric Co., Kokomo, Ind.

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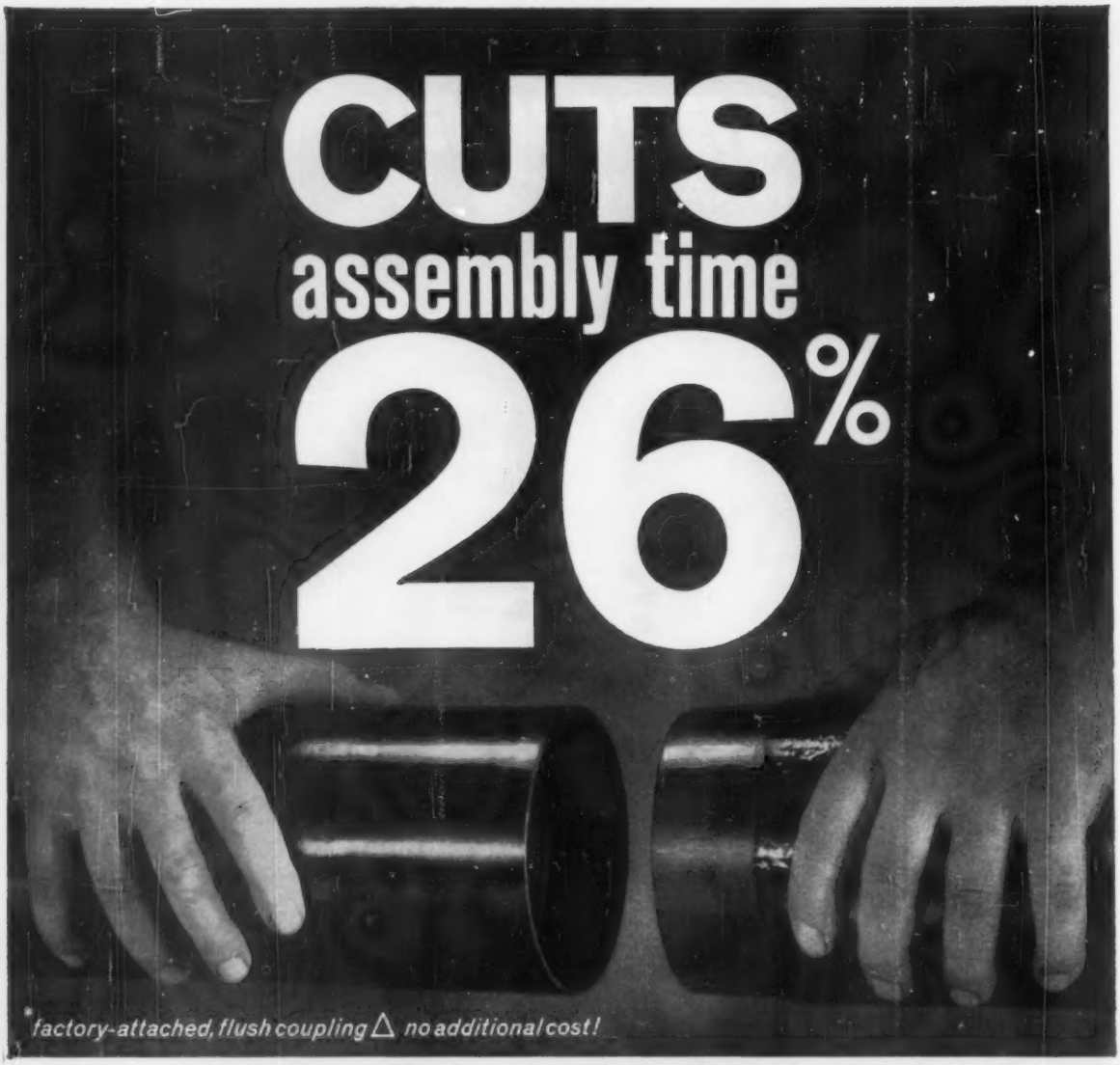

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NECA Discussions Urge Greater Contractor Role in Market Opportunities

Development of expanded contractor services to meet growing customer needs was emphasized at the Miami Beach convention of the National Electrical Contractors Association.

Contractor development, a program devoted to expanding the electrical contractor's role in electrical craft services through modern marketing methods and sound business management practices, keynoted the NECA convention business program.

Speakers noted the "virtually limitless" scope of the potential electrical craft market of which electrical contractors are doing "little more than a third." They urged modern marketing methods as against the contractor's traditional professional attitude toward soliciting business. They called for a more rigorous attention to profit-making and profit-opportunity instead of volume-oriented management policies.

"Shaping Our Future" was the theme of the 58th annual convention of the National Electrical Contractors Association and the Fifth National Electrical Exposition held at the Hotel Fontainebleau, Miami Beach, Fla., November 9 to 12. Registration totalled over 3,000 members and guests.

Harold A. Webster of T. Frederick Jackson, Inc., Long Island City, N. Y., and president-elect of NECA, said that the Association must continue to educate non-members as well as members to "induce competitors to insist on a profit on every job." Pricing a competitor out of business is not a profitable venture, he advised. His remarks reflected the growing concern in the construction industry over what has been called a profitless prosperity caused by extremely low bidding that is resulting in a growing number of serious failures in the contracting field.

President Oliver F. Burnett said that a profit-starved company and industry with a profit level below that required for its necessary growth are national liabilities.

Clint J. Harder, secretary treasurer of NECA, reported that the Association has, as of September 30, 4,251 members, a net gain of 150. Of the 4,251 members, 4,074 are in Chapters and 177 are individual members. The Association now has 122 Chapters.

Election of Officers

Harold A. Webster, president of T. Frederick Jackson, Inc., Long Island City, N. Y., was unanimously elected president of the National Electrical Contractors Association for a two-year term beginning January 1, 1960. Mr. Webster succeeds Oliver F. Burnett of the Kelso-Burnett Electric Co., Chicago, Ill.

Also elected were two new district vice presidents, a new vice president of Line Constructors, and re-elected three district vice presidents. William G. Nordling, Nordling Dean & Co., Inc., Summit, N. J., and governor of the New Jersey (Newark) Chapter, was elected to succeed Mr. Webster as vice president of District One. Norman D. Ferguson, California Electric Works, San Diego, Calif., and governor of the San Diego County Chapter, was elected vice president of District Nine to succeed J. D. O'Connor, Sacramento, Calif.

Gordon S. Heylin, Utilities Line Construction Co., Inc., Jenkintown, Pa., was elected vice president of Line Constructors succeeding Charles W. Moseley, R. H. Bouligny, Inc., Charlotte, N. C.

Re-elected vice presidents included Carl L. Teal, Knight Electric Co., Birmingham, Ala., District Three; G. C. White, Empire Electric Co., Inc., Fort Worth, Tex., District Five, and Richard W. Osborn, Osborn Electric Co., St. Louis, Mo.

Lighting Breakthrough

The exciting new opportunities for electrical contractors that have been and are being brought about by lighting were dramatically presented by Willard C. Brown, manager of Lighting Education, Large Lamp Department of the General Electric Company, Cleveland. These opportunities involve not only lighting, but new opportunities in other NECA programs, such as electric heating, air-conditioning (cooling), and adequate wiring, he said. Using both lantern slides and stage props and demonstrations, he effectively reviewed the whole panorama of lighting, including lighting fundamentals, new IES higher lighting levels, lighting technology, light sources, luminaires and application techniques, heat from light sources (advantages and disadvantages), and lighting economics.

High lighting level installations must be planned carefully, Mr. Brown continued, to insure visual comfort. This means choosing the lighting fixtures carefully, and with proper shielding to prevent direct and reflected glare, he said. Also, he stressed that higher lighting levels also mean more heat, which can yield important benefits. He urged electrical contractors to give this matter careful consideration —use of airflow control to dissipate heat in summer, and to heat buildings in cold weather. This can mean an added bonus for the lighting industry, he pointed out.

Contracting Out

A three-man panel discussed the subject of "Contracting Out," presenting viewpoints from three separate industry segments—electric utilities, electrical contractors, and labor unions. Moderator was F. E.

E. E. Leasure, Jr., Monroe Electric Co.; Fred Stocek, Hoffman Electric Co.; W. W. Giesen, W. W. Giesen Electric Co.—all of Chicago, Illinois; John Kvalsten, Kvalsten Electric Co., Minneapolis, Minn.; Wm. N. Collins, Collins Electrical Construction Co., St. Paul, Minnesota; Paul L. Briggs, Briggs Electric Co., Spokane, Wash.; Maynard Sundt, Manager, Puget Sound Chapter, NECA, Seattle, Washington; W. J. McDonald, Electric Service Co., Ann Arbor, Mich.; M. H. Dunham, Genesee Electric Co., Flint, Michigan.

Keith, chairman of the NECA Marketing Committee, Keith Electric Co., Des Moines, Iowa. Panelists were: Gerald A. Hadden, vice president, Consolidated Edison Co. of N. Y., Inc; T. R. Armstrong, The Becker Electric Co., Cincinnati, Ohio; and John H. Lyons, Jr., vice president, International Association of Bridge and Ornamental Iron Workers, Washington, D. C.

Mr. Hadden reviewed construction work which has been done by Consolidated Edison Co., and that work now under way and planned. Property assets now total about $2.25 billion, he said, and construction totals about $200 million annually. All but 10% is contracted out, he said, and the 10% which is performed by company personnel involves the work on a vast underground transmission system which is highly complicated, requiring specially-trained personnel.

Mr. Armstrong explained the approach of a small electrical contractor in soliciting industrial and commercial maintenance work, which is solicited on the basis of knowledge of the customer's problems and requirements, and the contractor's ability to do this work economically. His sales approach was defined in considerable detail.

Electrical contractors should take more interest in contract maintenance, according to John H. Lyons, Jr., who discussed this subject from a long-range viewpoint. The economics of "contracting out" are to the advantage of the electrical contractor, he said, following a detailed explanation of some of the things that have occurred, and are currently being done, in maintenance and repair work in industry. Plant management has been subject to pressures from in-plant personnel, he declared, which has prevented this work from being contracted for with outside organizations. The protests of contractors and contractor associations brought about negotiations by building trade unions, beginning in 1954, which have now culminated in the Continuing Contract Maintenance Program.

AEC Construction and Procurement

The specialty role of electrical contractors is a very important part of the atomic energy construction program, said John A. Derry, director, Division of Construction and Supply, U. S. Atomic Energy Commission, in a discussion of the AEC construction program and construction procurement practices. The construction program is a dynamic one, he said, involving a variety of facilities to keep pace with an expanding nuclear technology. Also, there is very little standardization, since the AEC programs are largely developmental, he said, requiring development of new materials and new construction methods and techniques.

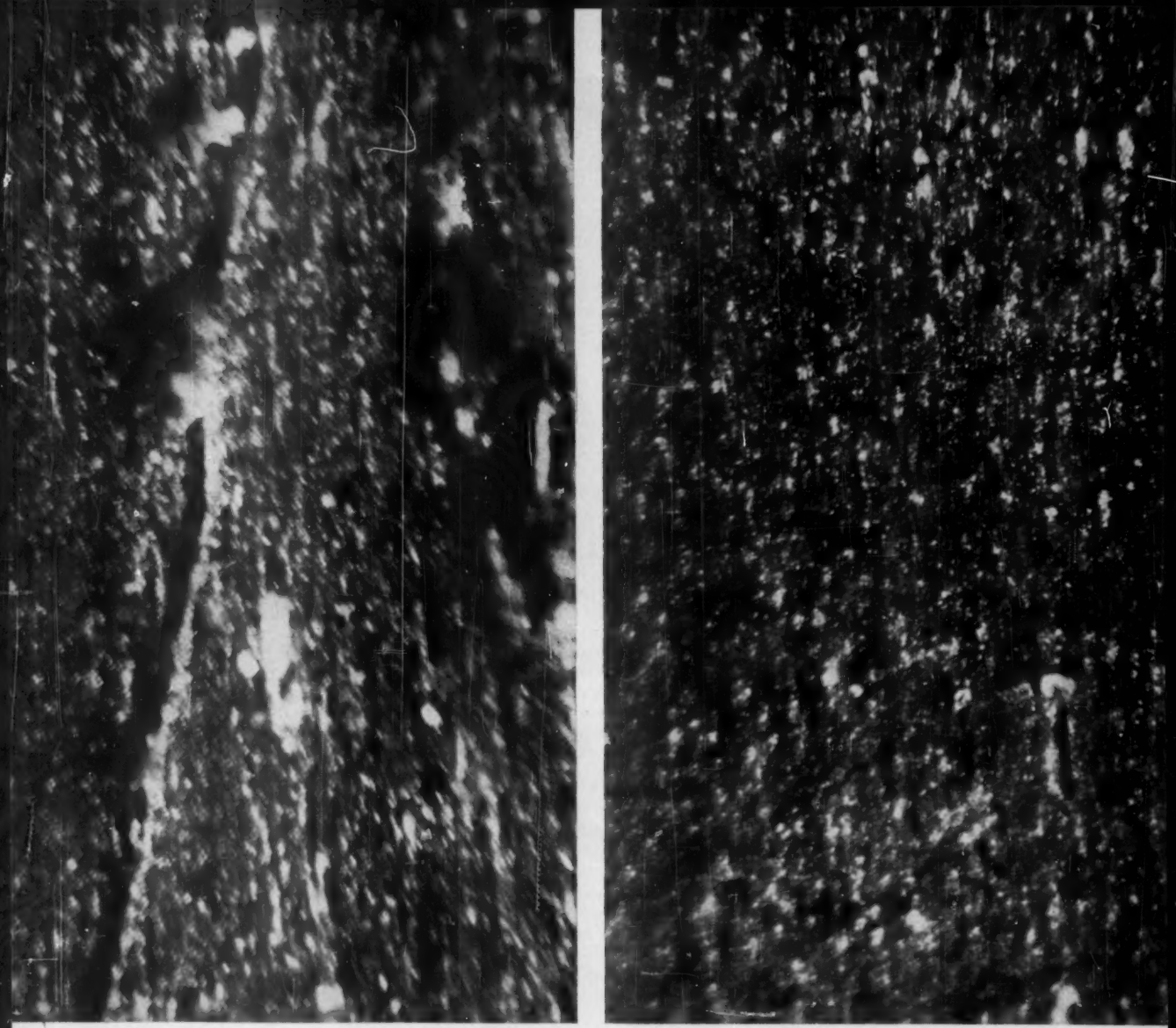
NE Code

The National Electrical Code was the subject of a panel discussion involving: Richard W. Osborn, Osborn Electric Co., St. Louis, Mo.; H. B. Whitaker, Underwriters' Laboratories, New York, N. Y.; and Dewey Johnson, Chief Electrical Inspector, Atlanta, Ga. As panel moderator, Osborn outlined the contractor's role in developing and improving the national code. He cited the responsibility of the contractor in knowing the code and promoting its application. In the overall discussion, emphasis was placed on new rules in the 1959 code and on trends in electrical application.

Johnson discussed the new code allowance of unlimited numbers of conductors in conduit (new Table 1, Chapter 9, NEC), basing conduit fill only on percent of conduit cross-section area. He stated that this would offer some needed relief from the old rule that no more than nine wires (for power and light) be used in a single conduit. However, the derating penalty for such application greatly reduces efficiency of copper application and could make extreme application economically unwise.

Whitaker appraised the future role of aluminum conduit in electrical systems. As far as the code is concerned, "rigid metal conduit" may be either steel or aluminum. Application of aluminum conduit is therefore the same as steel, in all types of occupancies including hazardous locations. He noted that careful engineering should go into all conduit applications to assure safe and reliable conditions for ambient moisture and potential corrosive influences. The other panel members urged care in use of aluminum until widespread experience has been gained with it. One such caution was on use of steel wire for pulling conductors in aluminum conduit.

Increase in the complexity of proper application of overcurrent devices has resulted from the need for higher interrupting ratings and better coordination in such devices in systems. Code coverage on fuses has been expanded to meet some of the growing problems, Whitaker explained. But there is still a lot to be done in the whole field of overcurrent protection, involving current limitation, let-through energy, effective short-circuit application and time-delay operation. New code rules were cited on these problems, including the mandatory use of type S plug fuses.



One of the best tests for comparing high-voltage compound dispersion consists of cutting thin sections from cable insulation—then stretching them and examining them under a microscope. Above, you see magnified sections of ordinary cable insulation (left) and Anaconda Butyl (AB) insulation (right). Note the even grain structure, the better dispersion of the Anaconda Butyl (AB) Cable.

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Specifications

A lively panel discussion covered the very important subject of plans and specifications. This analyzed concerted industry efforts to develop a national code of practice for the preparation of plans and specifications. The panel included: Kenneth Priestley, The Eastern Electrical Co., Bridgeport, Conn.; J. Stewart Stein, president, Construction Specifications Institute, with Sobel & Stein, Architects, Franklin Park, Ill.; William Tao, Consulting Engineer, St. Louis, Mo.; and James D. Witherspoon, Westinghouse Electric Corp., Pittsburgh, Pa.

High-Intensity Lighting

A round table discussion on the practical and technical aspects of the new higher levels of lighting recommended for all applications involved a number of outstanding authorities on the subject: Willard C. Brown, General Electric Co., Nela Park, Ohio; Edward J. Benesch, chief engineer, and R. Tuttle, asst. ch. elect. engr., Syska & Hennessy Inc., Consulting Engineers, New York, N. Y.; and Charles Amick, Day-Brite Lighting Inc., St. Louis, Mo.

Brown reviewed the findings of the Blackwell report, which recommended integral multiples of the old accepted levels. He pointed out that the new levels would be more expensive to achieve on the basis of first cost of equipment and cost of the electrical system necessary to supply the required footcandle levels. Benesch related the new lighting loads to required air conditioning capacity. An average lighting system producing 45-fc intensity represents about 25-33% of the total heat load on the air conditioning system. A lighting system producing 100-fc level is a heat load equal to 1½ that of the 50-fc system. For a 150-fc lighting system, twice the air conditioning capacity is required as that for 50-fc system. An increase in air conditioning load involves compressor capacities, piping, ducts, sheetmetal work. One possibility discussed by a number of the panelists was the use of the lighting system heat to heat the building areas in cold weather. One such method would use the lighting heat to heat ventilation air in winter.

In electrical load, Tuttle pointed out that capacity of the system must be doubled to go from 50 to 100 footcandles. Lighting loads in watts/sq. ft. increase almost directly with lighting level increase. To go from 50 to 200 footcandles is roughly a load increase of 2½ times. Load increase for refrigeration capacity is 60% when lighting level goes from 50 to 150 footcandles. He also pointed out that higher lighting levels will have a marked effect on the complexity of control wiring for air conditioning.

Amick analyzed the new levels in terms of engineered visual environment. He stressed the importance of quality of lighting to make the new levels acceptable and effective. This will have many and far-reaching effects in equipment design which must provide the necessary shielding for low-brightness and proper comfort control of light output. He also cited the possibility of combination lighting-heating systems and the use of air conditioning outlets in conjunction with lighting fixtures.

Diversified Specialization

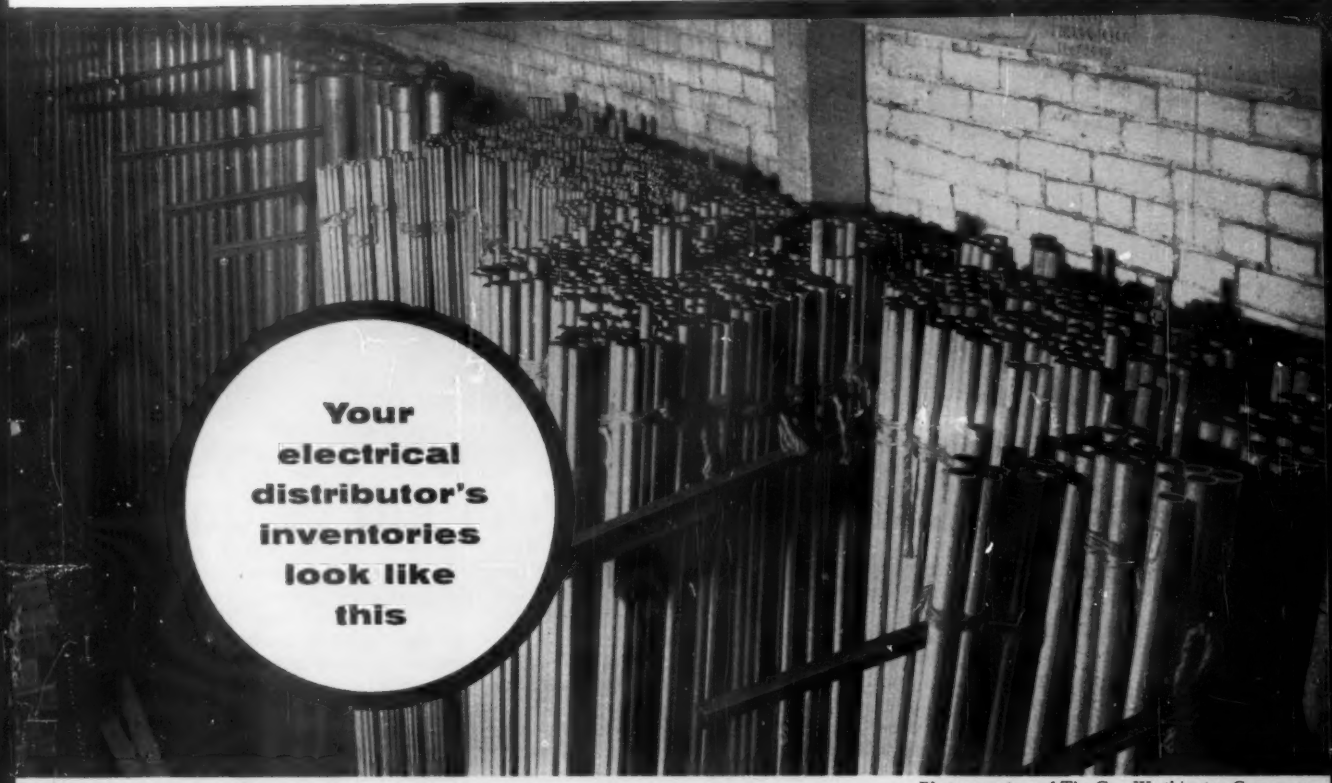
An electrical contractor can diversify his activities and specialize in every type of electrical work for which he is qualified. That is the firm belief of Norman D. Ferguson, president of California Electrical Works, San Diego, Calif. He related how his firm, with some 250 employees, does better than a $4 million annual gross in 12 specialized departments running the gamut from motor repairs to subdivision wiring and plant electrical maintenance. Keys to profitable diversification include a knowledge of the market potential in the area, 24-hour service facilities, and an organizational plan that delegates definite areas of responsibility along with authority.

Labor Relations

Maintenance of good labor relations is important to securing an adequate supply of skilled manpower for electrical contractors. Establishment of economically sound wages and working conditions and settlement of disputes is the province of NECA's Labor Relations Department. Director W. J. Cour, reported that there are now four regional labor relations offices which kept about 30% of the disputed cases last year from reaching the final tribunal—The Council of Industrial Relations. During four sessions last year, the Council heard and decided 70 cases.

Apprentice Training

Through recent revision of regulations in the 1958 National Defense Educational Act (Public Law 85-864), the electrical construction industry can get the necessary aid to support apprenticeship and training programs, reported Bill Damon, director, National Joint Apprenticeship and Training Committee. For the program to be effective, voluntary area committees are needed in each of some 500-odd wage areas with labor agreements clearly stating the responsibility



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and authority of such committees. Management leaves much to be desired in local committee operation, Damon noted. Management people are not active in these meetings.

Despite this apparent lack of management interest, there are now 496 labor agreements providing JATC's compared to 84 in 1953. At 79 apprentice training completion ceremonies during the past 10 months, 2,277 certificates were awarded. As of Sept. 1959, the Labor Department reports 17,345 registered apprentices in this industry.

Benefit Fund

Benefit Fund collections for the first eight months of 1959 averaged $758,000, a 1% increase over the same 1958 period. August collections were up about 7% over the same month last year.

As of June 1959, there were 120,410 electrical workers employed in 14,731 shops. Of this total, 60% were employed by NECA contractors. Ten percent of all employers in the fund had total payrolls of over $120,000 for 1958. Of this group, 74% were NECA members, the report indicated. A decrease of about 10,000 employees appeared in the employment total. Most of these were in firms employing over 51 men per shop.

Journeyman Training

Journeyman electricians must acquire more technical knowledge and training to keep abreast of new developments and techniques in the industry, stated Gordon M. Freeman, international president, IBEW. This is particularly important in the present electronic age to regain work lost when manufacturers sell electrical systems on an installed basis complete with maintenance contract to be performed by "factory-trained technicians," he noted.

To meet this situation, the IBEW now has a Director of Skill Improvement, Joseph E. Taylor, whose full-time responsibility will be to survey the industry and help establish journeyman training programs to supplement the existing Joint Apprenticeship and Training Programs. Freeman urged NECA members to establish such journeyman training programs under existing JATC's or some other joint committee, if preferred.

Other points brought out in Freeman's talk: The IBEW solidly supports (1) the Construction Industry Joint Council; (2) Maintenance by Contract with contractors participating in the program of signing agreements for maintenance work in manufacturing establishments; (3) Clarification of agreements to establish work to be done by electricians; (4) The Council on Industrial Relations which for almost 40 years permitted settling of disputes with dignity and honor and without resorting to strike tactics. Since the Taft-Hartley law was enacted in 1947, IBEW membership has increased from 382,000 to almost 750,000. While IBEW condemns and will continue to work for repeal of the new labor law, its members will obey it. Demand for skilled workers increases even as job opportunities, in general, decline. Areas with most vacancies are the electrical and aeronautical (particularly missile) fields, both under NECA-IBEW jurisdiction. We must become more skilled, experts in electricity and electronics, if we are going to grasp, hold and dominate what is ours for the taking, he concluded.

The Comstock Award

Louis K. Comstock, founder of L. K. Comstock & Co., Inc., New York City, received a signal honor when he was p sented with a testimonial scroll announcing establishment, by the NECA Board of Governors, of a permanent "Louis K. Comstock Award" in the field of Labor Relations. The Award, consisting of a medal and purse, is to be given each year to that person who, in the opinion of the NECA Executive Committee, has during the past year made the greatest contribution through the Association in the field of Labor Relations.

Contractor Development Program

A contractor development program designed to increase the capacity of the electrical contracting industry so it can keep pace with its rapidly growing markets was announced.

In outlining the program, which is based on a two-year field research study, Oliver F. Burnett, president of NECA, said it was a bold and pioneering step in association service to an industry. He warned that unless this or some better plan is followed, the industry will drift into oblivion, "for to stand still is to die."

Mr. Burnett's remarks were based on a joint report of the NECA Marketing and Research Committees who proposed that this program involving a plan for self improvement of contractor management capabilities and relying on selling effort as the principal means of earning business be made the dominant Association program.

The research disclosed that the potential demand for electrical contractor services is almost limitless. It measured the electrical craft market in terms of value of installed electrical materials, equipment and apparatus at $14.4 billion annually. Electrical use, and consequently demand for contractor services, is doubling each ten years. The study showed that the con-

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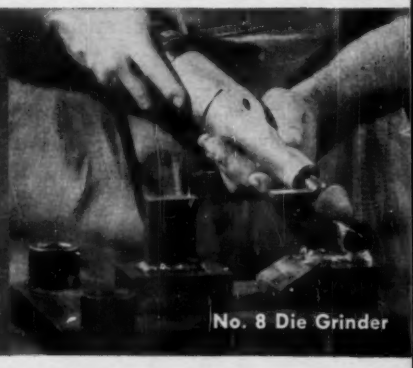
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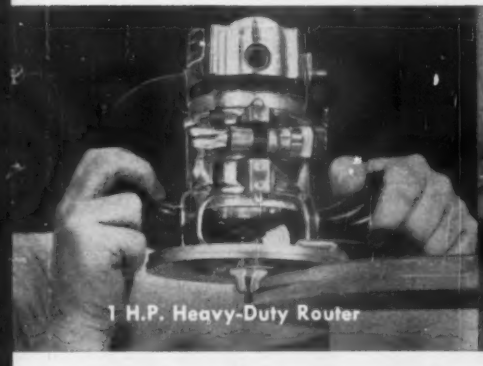
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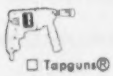
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tractors faced a challenge in developing their organizations to fill this booming need.

Resolutions

Convention delegates gave unanimous approval to resolutions calling for the following association action:

Procurement Responsibility—To insure maximum efficiency and economy in electrical construction, NECA recommends that manufacturers and suppliers carefully study trade jurisdiction for installation, service and repair of such systems as closed-circuit television, fire alarm, electric ceilings, lightning arrester equipment, motor generator sets and other equipment normally furnished by electrical contractors.

When such work normally and logically falls within the province of electrical contractors, solicitation of such equipment orders should be confined to electrical contractors only on construction projects where the equipment meets the specifications. Also, that these suppliers and manufacturers cooperate by urging specification writers to include the complete furnishing and installation of such equipment in the electrical section of the plans and specifications.

Unfair Utility Competition—That NECA condemn, and ask responsible utilities and other branches of the industry to refrain from, the unfair competitive practice of providing and installing facilities for electrical use on owner's premises. These practices include utility-installed outdoor lighting on a rental basis (dawn-to-dusk lighting) and wiring beyond the meter. NECA noted that these practices are especially aggravating when pursued by an organization enjoying a franchise status and permitted to include cost of such operations in the base for rate-making.

Robert W. McChesney—That NECA honor the memory of the late Robert W. McChesney and express its appreciation for his many contributions to the electrical industry and the Association during his 20 years of NECA activity and 10 years as president.

Among the actions taken by the Board of Governors were approval of an inter-industry cooperation policy statement and a resolution covering local market and employment statistics. The statement relates that electrical contractors have a responsibility to build up the electrical industry through creative sales effort; that it is proper and desirable for manufacturers and distributors of product and energy to assist in shifting the burden of the selling effort to the contractor.

Industry Awards

Charles P. Bobe, St. Louis, Mo., chairman of the NECA Research Committee, received the third Coggeshall Award for the outstanding service he rendered the industry in developing new methods and techniques in presenting management training to contractors. O. F. Burnett of Kelso-Burnett Electric Co. and president of NECA made the presentation. The citation read:

"During the past year under the guidance and with the tireless and diligent assistance of Charles P. Bobe, a new direction has been given to the Technical and Training Services of the Association. As a result a much wider use of these services, with consequent benefits to the Industry in improving electrical contractor competence, appears likely.

"For five years Colonel Bobe has served as Chairman of the Research Committee of this Association. In that capacity he gave unstintingly of his time. Not content with collaborating in the development of the courses of instruction, he personally assisted in field testing these educational efforts. He led the way in proving that electrical contractors, or their personnel, can serve as competent instructors for training courses. He personally very successfully served as instructor for many courses sponsored by the Chapter of which he is a member. He never missed an opportunity to assist any group of contractors in using the courses. His travels brought him into intimate contact with electrical contractors throughout the country.

"His many contacts convinced him that the carrying of management instruction to contractors could be further implemented through workshops that gave contractors an opportunity to help themselves through exchanges with other contractors. Not content with the present use of the educational courses by the contractors, Colonel Bobe saw in the Market Research Program valuable aids to improving and popularizing the Technical and Training Services and the educational courses. He worked in close cooperation with the Marketing Committee in bringing the study to a conclusion. From these joint activities the Contractor Development Program, based on contractor self-analysis, was conceived and his understanding of the broad objective and details of application were valuable contributions to this new phase of management improvement in the Industry.

"Mindful that his enthusiasm, his eagerness to work long and hard, and his breadth of vision have brought new methods, new approaches and new techniques to the Industry's management training, the Committee of Awards has unanimously selected Colonel Bobe as recipient of this year's, the third, Coggeshall Award provided in the Will of the late Allan Coggeshall to honor the member of the National Electrical Contractors Association adjudged to have made an outstanding contribution to the Electrical Contracting Industry in technical and training activities."

McGraw Award

Edwin H. Herzberg, manager of the Milwaukee Chapter of the National Electrical Contractors Association, received the Contractors Medal and Purse, given under the

James H. McGraw Award.

The panel of judges who recommended Mr. Herzberg for recognition under the Award consisted of O. F. Burnett, Kelso-Burnett Electric Co.; E. C. Carlson, Carlson Electric Co.; D. B. Clayton, Sr., Electric Constructors Inc.; H. A. Webster, T. Frederick Jackson, Inc.; and W. T. Stuart, representing the Committee of Awards. H. A. Webster, of T. Frederick Jackson, Inc. and president-elect of NECA, made the presentation for the Committee of Awards. The citation read:

"Edwin H. Herzberg recognized, in the years of industry growth preceding World War II, the vital need for developing men with an advanced degree of mechanical and technical skills to serve the expanding demands of the electrical contracting industry.

"Up to that time apprentice training was little more than a required period of work experience under the administration of the union or individual electrical contractors. Classroom or textbook instruction was practically non-existent.

"Mr. Herzberg conceived the idea of sponsorship of not only apprenticeship, but also the continuous training of journeymen electricians, as a joint responsibility of the contractor and the union. He saw, further, the need for a planned program, carefully administered, providing balanced on-the-job and classroom development of latent skills.

"He established a model joint apprentice training program in Milwaukee but also recognized that such programs should be developed on a national scale. In 1940 he was appointed Chairman of the Apprenticeship Committee of the National Electrical Contractors Association. He set out on his own initiative to interest the contractors and union in the establishment of a National Joint Committee to prepare industry apprenticeship standards for submission to and approval by the United States Department of Labor.

"When the National Joint Apprenticeship and Training Committee for the Electrical Industry was formed in 1941, largely due to his efforts, he was selected to be its first chairman, a position he held for almost twelve years thereafter.

"He prepared, with the assistance of those he could induce to help him, national standards of apprenticeship and training which were ultimately approved by the Department of Labor. He then worked tirelessly to encourage their adoption and was personally responsible for the establishment of many local programs.

"As a result, there are today 400 joint apprenticeship and training programs covering most areas of the United States with 18,000 apprentices enrolled.

"For his dynamic concept of apprentice training and energetic personal dedication to its development, the Committee of Awards upon the recommendation of the Committee of Judges, presents to Edwin H. Herzberg the 1959 Contractors Medal and Purse given by the James H. McGraw Award for Electrical Men."

NEMA Plans Reorganization

The National Electrical Manufacturers Association approved a reorganization plan during its annual convention held in Atlantic City, November 9 to 12. The new plan calls for the formation of eight semi-autonomous Divisions, composed of industry product sections having mutual interests, guided by their own Boards of Directors, and represented in NEMA's policy-making circles by their own duly elected divisional vice president.

Divisions will be composed of sections whose member companies produce consumer products, lighting equipment, industrial equipment, building equipment, insulating materials, wire and cable, generation, transmission and distribution equipment, and industrial electronics and communications equipment.

Mr. N. J. MacDonald, president of the Thomas & Betts Company, Elizabeth, N. J., was elected president of NEMA, succeeding J. L. Singleton, senior vice president, Industries Group, Allis-Chalmers Manufacturing Co. W. C. Wichman, of Chicago, Ill., was elected vice president, and A. D. R. Fraser, president of Rome Cable Corp., Rome, N. Y., was elected treasurer.

A survey of recent sales of electrical service entrance equipment and wiring among manufacturers indicates that American homes enjoy much greater power capacities today, for their electrical utilization, than before the large-scale concentrated national promotion of home wiring and its benefits by national associations such as Edison Electric Institute and the National Wiring Bureau. This comment was made by C. W. Higbee, assistant general manager of the Electrical Conductor Division of the Kaiser Aluminum and Chemical Company at the NEMA meeting.

Joseph F. Miller, managing director of NEMA, announced that national responsibility for administration of the Medallion Home Program will be assumed next year by the National Electrical Manufacturers Association.

N. J. MacDONALD, president of The Thomas & Betts Co., Elizabeth, N. J., was elected president of NEMA.

Utilities Step Up Electric Heat Support

At the fourth *Electrical World* conference on Electric Heating in St. Louis, Mo., Oct. 21-22, discussions indicated that the challenge of providing winter loads to match rising summer peaks is facing more utilities than ever before. The meeting was jointly sponsored by *Electrical World* and NEMA's Electric House Heating Equipment Section.

Electrical World's most recent survey of 134 utilities indicates the extent to which electric heat is being added to utility lines to meet this challenge. The survey, reported on by EW's Tom Jordan, shows that in the period from Nov. 1, 1957 to June 30, 1959, complete home installations of resistance heating rose from 261,000 to 548,000; heat pumps from 14,500 to 33,700. Commercial and industrial installations in the same period increased from 29,000 to 33,000 for resistance heat; 9,000 to 27,100 for heat pumps.

In his opening remarks C. F. Hochgesang, *Electrical World's* editor, pointed out a new consideration implementing electric heat studies by utilities: the so-called "kilowatt-hour barrier." The idea in past years that utility growth rate was destined to double every ten years, thus enabling rates to be held relatively constant through increased power generation, seems to have been proved wrong. The rate of increase appears to be leveling off below expectations, indicating, for the residential user, a maximum annual consumption "barrier" of around 5000 kwhrs—unless a new important load picks up where air conditioning and other load stimulants leave off. Obviously, electric heat is the most promising load in sight to do the job.

Reporting on the operation of the 1547-heat-pump installations in dwellings of the Little Rock Air Force Base, William M. Shepherd (Arkansas Power and Light Co.) disclosed that in the past 12 months

DON E. ROSENTHAL was appointed recently executive director of the Electrical League of New York, Inc. He was formerly executive secretary of the St. Louis Electrical Board of Trade. The Electrical League of New York, formerly the Electrical Associates, Inc., is composed of people in all branches of the electrical industry of the City of New York, such as manufacturers, distributors, contractors, dealers, inspectors, architects and engineers.

there have been 2219 service calls on the units, an average of 1.44 calls per unit per year. More than 500 of the units have operated continuously since installation with no trouble at all.

Malcolm R. Rodger (Middle West Service Co.) cautioned against under estimating the gas industry as a competitor, even though a recent report to Congress stated that use of electricity is expected to exceed that of any other fuel by 1975. The fact that a minimum of 150 utilities have filed electric heating rates averaging 1½ to 1¾ cents per kwhr will certainly aid in fulfilling this expectation.

To aid in reaching such higher equipment standards, NEMA's Electric House Heating Equipment Section has developed a set of standards for the heaters offered by its member manufacturers. C. F. Kreiser (Edwin L. Wiegand Co.), chairman of the NEMA section, detailed provisions of the new standard, adding the expectation that non-member manufacturers would attempt to meet these standards with sufficient insistence on the part of the utility.

The importance of proper insulating methods to economical operation of heating equipment was outlined by James Verhalen (United States Mineral Wool Co.), emphasizing the necessity for supervision of construction and proper attention to adequate vapor barriers.

NISA News

"Electrical Apparatus Service Association" may be the new name of the National Industrial Service Association if the presidents of NISA's 39 chapters have their way.

Meeting in St. Louis last September, the presidents suggested to the NISA board of directors that a more appropriate and descriptive name be adopted.

Since then NISA's Puget Sound Chapter adopted a resolution calling for a new name, preferably "Electrical Apparatus Service Association," one of the three names suggested at the Chapter Officers Conference in St. Louis.

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A foremen's night was held by Los Angeles Chapter on Nov. 10.

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Manufacturers interested in exhibiting at the 27th Annual Convention of NISA, to be held May 4-7, 1960, at Hotel Fontainebleau, Miami Beach, Florida, are urged to write Joseph M. Harrington, executive vice-president of the association, 7730 Carondelet Avenue, St. Louis 5, Mo., without delay.

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A special meeting of the Quaker City Chapter, NISA's Philadelphia area organization, will be held January 27 in conjunction with the 2nd Annual National Plant Maintenance & Engineering Show at the city's Public Auditorium. NISA will be one of 400 exhibitors at the Show with Quaker City members in charge of the booth and rewinding demonstrations.

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George T. Kinard, of Beaumont, Texas, was elected president of another big NISA chapter, the Southwestern, at the fall meeting in Houston. He will take office in the spring at the group's Dallas meeting (March 10-12) along with vice-presidents James A. Phares, Oklahoma City, Okla.; and J. M. Morgan, Fort Worth, Texas; and secretary-treasurer, Connie H. Henry, Dallas, Reelected executive secretary: Miss Ann Hickman, Forth Worth, Texas.

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Members of the Central Ohio Chapter received a free steak dinner at Hi-Timber Supper Club, Columbus, October 14, provided their dues were paid.

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N. G. Lyall, product manager, Scotchcast Resin Division, 3-M Co., was the principal speaker at the November 10 meeting of Chicago Chapter at Hotel Graemere. H. E. Smith, manager, agent and renewal parts and sales division, General Electric Co., described service problems encountered on a-c motors.

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O. M. Mac Na Ma, district manager, Sterling Electric Motors, was the principal speaker at Foremen's Night, sponsored by the Los Angeles Chapter of NISA November 10, at Michael's Restaurant.

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More than 100 attended the joint meeting of Michigan's chapters in Lansing on November 9. Speakers included D. L. Bernhard, International Research and Development Co.; NISA executive vice-president Joseph M. Harrington; and the presidents of Western Michigan and Great Lakes Chapters, Paul Bogdan and Mason Green.

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The Helwig Carbon Products Co. was host to members of Wisconsin Chapter at a dinner meeting at Blue Mound Country Club, Milwaukee, on October 20. A brief program covered industrial requirements for carbon brushes.

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More than 40 firms were represented at the joint Rocky Mountain and Utah Chapter meeting in Salt Lake City, October 16-17, at Hotel Utah.

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Members of NISA's Mid-Atlantic Chapter assisted with the NISA exhibit at the 2nd Annual Conference on the Application of Insulation at the Snoreham Hotel, Washington, D. C. December 7-10.

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More than 75 attended the October 15 of the New York Metropolitan Chapter of NISA to hear George Martin of Insulation and Wires, Inc., discuss the importance of magnet wire to motor shops.

NISA S. E. Chapter Meets in Raleigh

The Southeastern Chapter of the National Industrial Service Association held its 21st annual meeting in Raleigh, N. C., at the Hotel Sir Walter, on October 29-31, with an official registration of 192 members and guests.

Precautions, safety devices and equipment care in metalizing were explained by Julius Nill, American Metalspray, Inc., Kannapolis, N. C. He also discussed the special technique used for applying molybdenum and other special metal coatings. For shaft build-up, he advocated the application of a mixture of oil and graphite immediately

after the metal application and before machining.

How to operate an electric and pneumatic tool repair facility was described by Roy Shinault, Roy's Electric Motor Service, Richmond, Va., whose company had developed a substantial business in the repair of tools and other specialties, including compressors and generator plants. Noting that electric tool sales are running in excess of $300 million a year, he urged the allotment of ample shelf space and inventory control for handling the large parts stocks involved.

Careful selection of repair materials is critically important in rebuilding hermetic motors, C. H. Lankford, NISA staff engineer, warned. Wire insulation and insulating materials must be considered for compatibility with the refrigerants and lubricants used. He reviewed a number of special manufacturers' reports available to guide the motor shop in the selection of appropriate materials.

The newer types of insulating varnishes have been developed and are being used because of improved chemical and heat properties, explained John D. Mayes, of the John C. Dolph Co., Monmouth Junction, N. J., which will cure in about half the time and at the same temperature, as would the older varnishes.

Owners of independent motor repair shops were told that their future business depended on their own skill, alertness and intelligence, by J. Arthur Turner, Jr., of Tampa Armature Works, Tampa, Fla. Mr. Turner, who is also vice president of NISA and director of NISA Region No. 5, recommended that the motor shop owners develop future plans and objectives on a three-part basis: one year, five years, and ten years, and to revise their plans at any time when national economy or local conditions indicated need for a change.

Information was supplied by Leo Kowal of Metals & Controls Service Department, Attleboro, Mass., on how to identify inherent overheat protectors, and how to use the code.

New officers of the Southeastern Chapter were announced, as follows: President—Lewis S. Bain, Jack's Electric Motor Repair, Inc., Fort Lauderdale, Fla.; Vice President—F. E. Cook, Electrical Equipment Co., Augusta, Ga; Secretary-Treasurer—Roy E. Shinault, Roy's Electric Motor Service, Richmond, Va. Chairman of the Convention Committee was William S. Ward, of Electric Motor Repair Co., Inc., Raleigh.

DATES AHEAD

National Association of Home Builders—16th annual convention and exposition, Conrad Hilton, Hotel Sherman, Chicago Coliseum, Chicago, Ill., January 17-21, 1960.

Industrial Heating Equipment Assn.—Annual winter meeting, Warwick Hotel, Philadelphia, Pa., January 18-19.

International Association of Electrical Inspectors—Kentucky Chapter, Kentucky Hotel, Louisville, Ky., January 21-22; Virginia Chapter, Mariner Hotel, North Virginia Beach Va., April 4-5.

Plant Maintenance & Engineering Show—Convention Hall, Philadelphia, Pa., January 25-28.

American Institute of Electrical Engineers—Winter general meeting, New York, N. Y., January 31-February 5.

National Industrial Electric Heating Conference—Netherland-Hilton Hotel, Cincinnati, Ohio, February 1-4.

National Electrical Week—National Promotion, February 7-13.

National Electrical Week Luncheon—Sheraton-Astor Hotel, New York, N. Y., February 9.

Power and Communication Contractors Assn.—15th annual convention, Brown Palace Hotel, Denver, Colo., February 14-16.

Upper Midwest Electric Industry Convention—Leamington Hotel and Municipal Auditorium, Minneapolis, Minn., February 14-17.

National Rural Electric Co-op. Assn.—18th annual meeting, Kiel Auditorium, St. Louis, Mo., February 22-25.

16th Annual National Wiring Sales Conference—Warwick Hotel, Philadelphia, Pa., February 25-26.

5th National Electrical Industries Show—New York Coliseum, New York, N. Y., March 6-9.

Electrical Maintenance Engineers Assn. of California—10th Biennial Electrical industry show, Shrine Exposition Hall, Los Angeles, Calif., March 23-26.

National Association of Electrical Distributors—Annual convention. Dallas, Texas, May 1-5.

National Industrial Service Assn., Inc.—Annual convention, Hotel Fontainbleau, Miami Beach, Fla., May 4-7.

National Fire Protection Assn.—Annual meeting, Montreal, Canada, May 16-20.

Illuminating Engineering Society—National Technical Conference, Penn-Sheraton Hotel, Pittsburgh, Pa., September 11-16.

Among the Manufacturers

Headquarters Announcements

Howell Electric Motors Co., Howell, Mich., has acquired the **Leland Electric Co.,** Dayton, Ohio.

H. K. Porter Co., Inc., Pittsburgh, Pa., has acquired the **Hill Transformer Corp.,** San Carlos, Calif.

Luminous Ceilings, Inc., have moved to larger quarters at 3701-59 N. Ravenswood Ave., Chicago, Ill.

International Rectifier Corp., El Segundo, Calif.—Ronald Henderson, manager, Market Research Dept.; J. T. Cataldo, senior vice president; James Conto, general sales manager.

Ramset Fastening System, New Haven, Conn.—Henry G. Walesch, field sales manager; R. W. Henning, product development and evaluation manager.

Cornell-Dubilier Electric Corp., South Plainfield, N. J.—Raymond T. Leary, general sales manager; Wayne Steinbarge, power-factor capacitor marketing manager, Power-Factor Div.

Triangle Conduit and Cable Co., Inc., New Brunswick, N. J.—Stephen Belansky and Peter E. Johnson, director and assistant director respectively of industrial relations; John F. Bahr, general traffic manager.

Westinghouse Electric Corp., Pittsburgh, Pa.—Raymond J. Stefany, manager, government and aviation lamp sales; C. C. Horstman, manager of engineering and sales, specialty transformer department.

Standard Wire and Cable Co., Los Angeles, Calif.—H. C. Harris, vice president and director of purchases.

Slater Electric & Mfg. Co., Glen Cove, N. Y.—Francis J. Cashin, general manager.

Globe Illumination Co., Los Angeles, Calif.—Jerry J. Silvers, national sales manager.

Kennecott Copper Corp., New York—M. D. Ayers, director of engineering.

International Resistance Co., Philadelphia, Pa.—Reed Waldron, sales promotion manager, distributor division.

International Register Co., Chicago, Ill.—R. C. Bedford, manager of distributor products.

Precision Transformer Corp., Chicago, Ill.—W. G. Warne, pro-

duction control manager.

Anaconda Wire & Cable Co., New York—Richard B. Steinmetz, president.

Electric Atolite Co., Toledo, Ohio—John Winslow, Roy Stott and Harry Seubert, chief engineers.

Emerson Electric Mfg. Co., St. Louis, Mo.—Floyd C. Weaver, small open motor sales supervisor.

Anderson Electric Corp., Birmingham, Ala.—Thurman L. Rundlett, chief engineer.

D. W. Onan & Sons, Inc.—Robert L. Westrum, manager for original equipment sales.

Pass & Seymour Inc., Solvay, N. Y.—David J. McCarty, general sales manager; Ted Mager, field sales manager.

Daystrom-Weston Sales Div., Daystrom, Inc., Newark, N. J.—David H. McGalliard, distributor sales manager.

Minnesota Mining & Mfg. Co., St. Paul, Minn.—Joseph C. Duke, executive vice president for sales and public relations.

Steel City Electric Co., Pittsburgh, Pa.—R. B. Mitchell, manager, distributor sales; G. W. Bickerstaff, manager, contractor sales and specifications; Norman A. Pemberton, advertising, publicity and sales promotion.

Christie Electric Corp., Los Angeles, Calif.—Hughes Co., Los Angeles, national sales agents for automatic charging equipment.

Leece-Neville Co., Cleveland, Ohio—Albert F. Goodrich, comptroller; George B. Howell, vice president of manufacturing.

Miller Co., Meriden, Conn.—Robert S. Rogge, sales manager, illuminating division.

Chester Cable Corp., Chester, N. Y.—James Henderson, plant superintendent.

Federal Lighting Corp., Cleveland, Ohio—Edward K. Raker, director of sales.

Metalcraft Products Co., Inc., Philadelphia, Pa.—P. R. Blackburn, sales manager, Metco lighting line.

Electric Specialty Co., Stamford, Conn.—William E. H. Reardon, vice president and sales manager; James H. Pierson, vice president and personnel director; Joseph J. Sousa, chief engineer; George C. Zimmerman, director of manufacturing.

Greenlee Tool Co., Rockford, Ill.—Martin J. Tuckett, general sales manager.

Moe Light Div., Thomas Industries, Inc., Louisville, Ky.—Kenneth D. Cummings, assistant sales manager.

Wolverine Tube, Div. of Calumet & Hecla, Inc., Allen Park, Mich.—R. E. Seaton, manager of processing and power sales.

United Electric Controls Co., Watertown, Mass.—George W. Clapp, sales manager.

Delta-Star Electric Div., H. K. Porter Co., Inc., Chicago, Ill.—Howard D. Tindall, manager of transformer sales and engineering.

Automatic Control Co., Minneapolis, Minn.—J. Fred Getz, manager, power and switchgear division.

General Time Corp., New York—John F. Carr, vice president.

William Brand & Co., Inc., Willimantic, Conn.—Frank Saunders, assistant sales manager, western division.

Clark Controller Co., Cleveland, Ohio—Everett F. Anderson, district engineer, Los Angeles division.

Triangle Conduit and Cable Co., New Brunswick, N. J.—Roger E. Martin, director of research and development.

Minnesota Mining & Manufacturing Co., St. Paul, Minn.—C. P. Pesek, director.

Regional Appointments

NEW ENGLAND

Allis-Chalmers Mfg. Co.: Jesse W. Bowen, Jr., sales representative, Boston district.

MIDDLE ATLANTIC

Ward Leonard Electric Co.: W. L. Patton, district manager, Pittsburgh office.

Allis-Chalmers Mfg. Co.: J. Desmond Kramer, representative, Buffalo district.

Edwards Co., Inc.: Eugene C. Nicholson, eastern regional manager.

Wolverine Tube, Div. of Calumet & Hecla, Inc.: F. K. Egan, sales representative, New York district.

Triad Transformer Corp.: Bob Nelson, representative for upper New York state area.

SOUTH ATLANTIC

Allis-Chalmers Mfg. Co.: David H. Weiss, sales representative, Washington office; J. M. Duncan, manager, Industries Group sales, Washington office; B. G. Camp, manager, Atlanta district.

Day-Brite Lighting, Inc.: George N. Maloomian, sales representative, Washington, D. C.

Feedrail Corp.: Murray C. Nelson, representative in Virginia, District of Columbia, Maryland and West Virginia.

EAST CENTRAL

Edwin F. Guth Co.: Thomas J. Evans, representative in Michigan.

Allis-Chalmers Mfg. Co.: Henry B. Cullom, representative in Indianapolis district office; Glenn M. Heck, Midwest regional representative for line of power plant equipment.

Stromberg Time Corp.: Lee P. Barsi, branch office manager, Chicago area; George W. Seaton, Akron branch office manager; George B. Buksar, manager of time equipment sales in Gary, Ind.; Magnus J. Gorrie, Southern District sales manager, time equipment division, office in Birmingham.

Lightolier Inc.: Ned Norworth, sales representative in Central Tennessee, Arkansas, northern Mississippi and part of Alabama.

Ward Leonard Electric Co.: Charles B. Durling, Chicago district manager.

WEST CENTRAL

Stromberg Time Corp.: James E. Stoll, manager, St. Louis office; George C. Thornton, Jr., Kansas City time equipment branch manager.

Day-Brite Lighting, Inc.: Bart M. Jordano, sales representative, Minneapolis-St. Paul area.

Sola Electric Co.: McDowell-Redlingshafer Sales Co., representative in Missouri, Kansas, Iowa, Nebraska, and Quincy, Ill.

Emerson Electric Mfg. Co.: Jack Rogers, regional sales manager, and Bill Richard, lighting specialist, new southwestern sales region.

Murray Mfg. Corp.: Russell L. Stewart, district sales representative for Kansas, Nebraska and western Missouri.

Ward Leonard Electric Co.: Robert Peterson, St. Louis district manager.

WEST

Standard Wire and Cable Co.: Barney L. Sutton, divisional manager of sales and marketing operations in San Francisco Bay area.

Stromberg Time Corp.: Norman Rivkees, West Coast district sales manager.

Kirlin Company: Robert E. Jones, representative in Seattle territory.

Allis-Chalmers Mfg. Co.: J. A. Longley, western regional representative for transmission and distribution equipment; T. E. Meyers, manager, San Francisco district; G. K. Lewis, manager, Portland district.

Advertising In This Issue

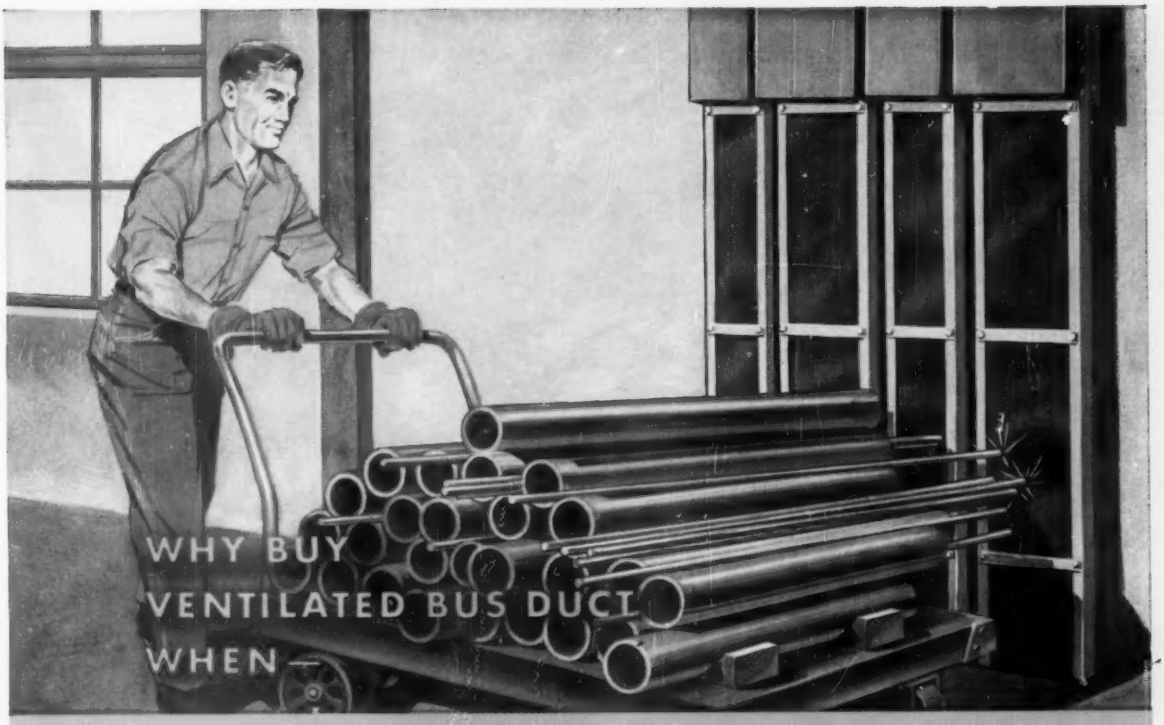
■

CLASSIFIED ADVERTISING
F. J. Eberle, Business Mgr.

EQUIPMENT
(Used or Surplus New)
For Sale 171

• These manufacturers advertised their products in the ELECTRICAL PRODUCTS GUIDE ISSUE

For more complete information, and application data on their lines, refer to the index of Advertisers in the ELECTRICAL PRODUCTS GUIDE . . . the 13th issue of ELECTRICAL CONSTRUCTION AND MAINTENANCE.



Square D TOTALLY ENCLOSED Duct* is SAFER—*and costs no more*

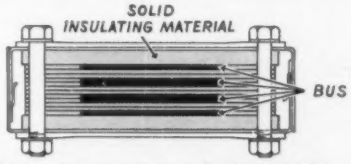
*(low impedance)

• Ventilated bus duct may be as vulnerable as it looks. In fact, Paragraph 3644 of the National Electrical Code prohibits its use in certain areas by specifying:

> **"Busways may extend vertically through dry floors if totally enclosed (unventilated) where passing through and for a minimum distance of six feet above the floor to provide adequate protection from mechanical injury."**

All Square D low-impedance duct is totally enclosed! It has no ventilation holes open to falling objects or dust. It's smaller than ordinary ventilated bus duct. It mounts in any position without de-rating. Doesn't it make sense, when buying low-impedance duct, to specify a product that's safer? Square D totally enclosed low-impedance duct costs no more—why settle for less!

Here's Why Square D's EXCLUSIVE Design makes ventilation unnecessary



The entire space within the duct and between the bus bars is filled with a solid insulating material which conducts the heat to the surface. There are no dead air spaces inside the duct. Square D totally enclosed low-impedance duct is listed with Underwriters' Laboratories and meets U/L requirements for temperature rise in any mounting position.

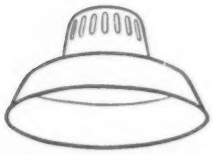
EC&M HEAVY INDUSTRY ELECTRICAL EQUIPMENT... NOW A PART OF THE SQUARE D LINE

SQUARE D COMPANY

Now you can get optional

SLOTTED Reflectors

on these Crouse/Hinds Lighting Fixtures



Explosion-proof—Type EV, Dust-ignition-proof—Type DL in slotted dome or angle reflectors.

Vapor-tight, weather resistant types V and VM in slotted dome or angle reflectors.

Reduce fatigue, accidents and worker tension; improve working environments and employee relations. In both original and replacement installations in major plants, the new slotted reflectors—exclusive with Crouse-Hinds—produce the following results:

- Elimination of dark, dungeon-like areas above reflectors
- Elimination of harsh brightness contrast, improving visibility and seeing comfort
- Reduction of fatigue of workers, and accidents due to fatigue
- Increase of production in machine work, assembly and inspection operations
- Reduce fixture operating temperature and worker discomfort from reflected heat, especially with low-hanging fixtures
- Reduced accumulation of dirt and dust, due to improved air circulation through reflectors
- Slotted reflectors are white enamel finish inside and out

FOR COMPLETE INFORMATION on all Crouse-Hinds lighting fixtures equipped with the new slotted reflectors, call your nearest Crouse-Hinds distributor, or write us.

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SYRACUSE NEW YORK

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